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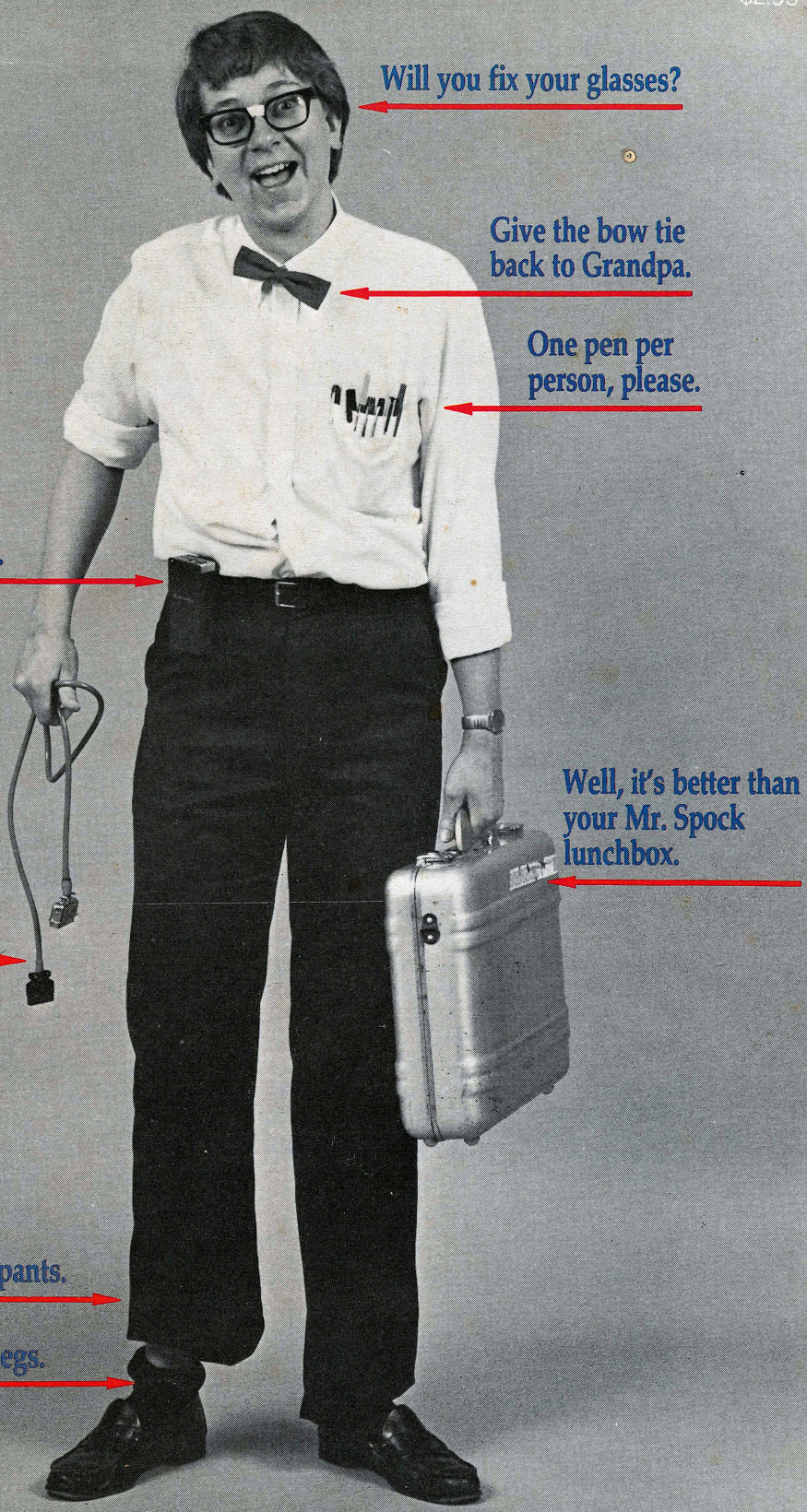
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EPSON WORLD
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Cover photograph by Benjamin Magro

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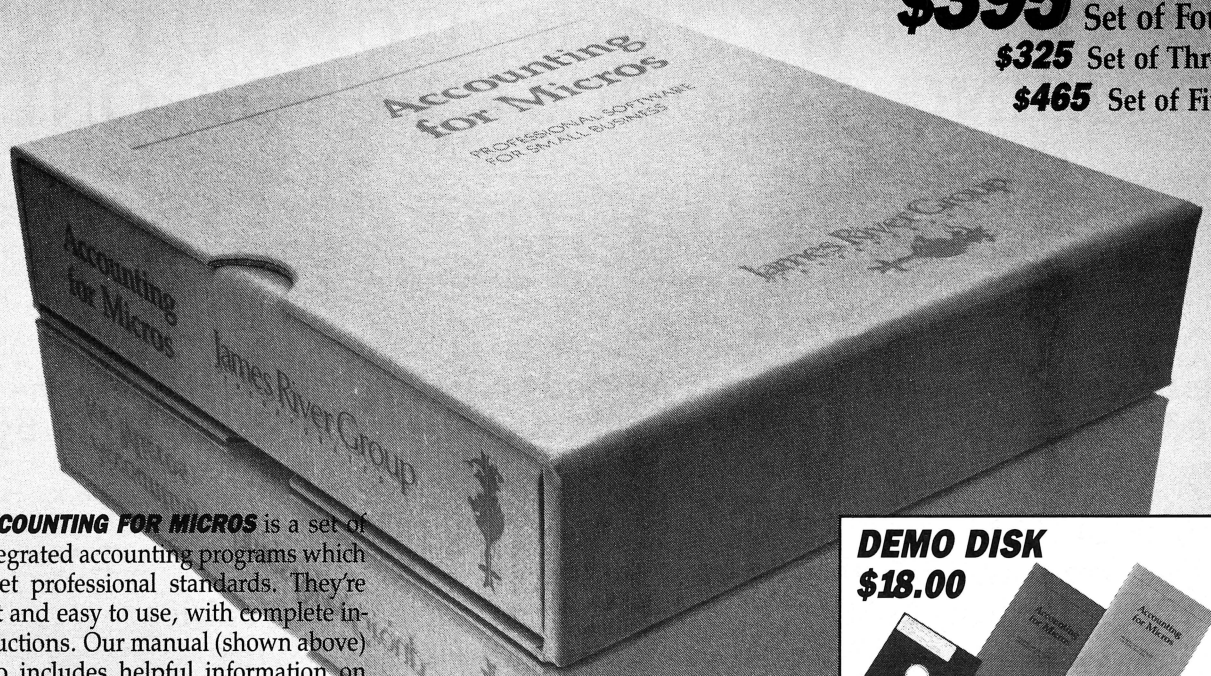

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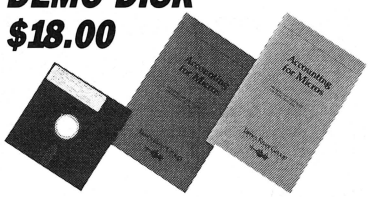

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A New Broom Arrives

One otherwise quiet Saturday morning a couple of weeks ago I got a call from Carl Cramer, the publisher of Epson World and leading man at Camden Communications. Would I be interested in taking over publication of Epson World? To make a long story short, my wife Pat and I accepted, and you now have a new publisher, explaining why this issue is a tad late.

I've worked with the Epson product line and RSI both as an engineer and writer (most recently as consulting editor for EW) since the QX-10 was introduced in the US in 1983, and know first hand some of the expectations, triumphs and frustrations felt by so many in the Epson and Rising Star community.

So, what can you expect from Epson World in the future? First, each issue should now leave our printer around the 25th of the month. Next month you'll see major changes in the layout and editorial material of Epson World.

Our new layout will pack as much (or more) material into our 48 pages as we used to print on 64. In addition to "meaty" applications articles, we're starting several departments including the Valdocs Chronicles, the MS-DOS Express, and the Language Laboratory along with tips and reports gathered from user group newsletters and bulletin boards across the country. You'll see increased coverage on desktop publishing and portable computing, and you'll still find technical articles like how to add more disk drives to your QX-10, build a color board switch arrangement for your QX-16 or troubleshoot your computer before sending it in for repair.

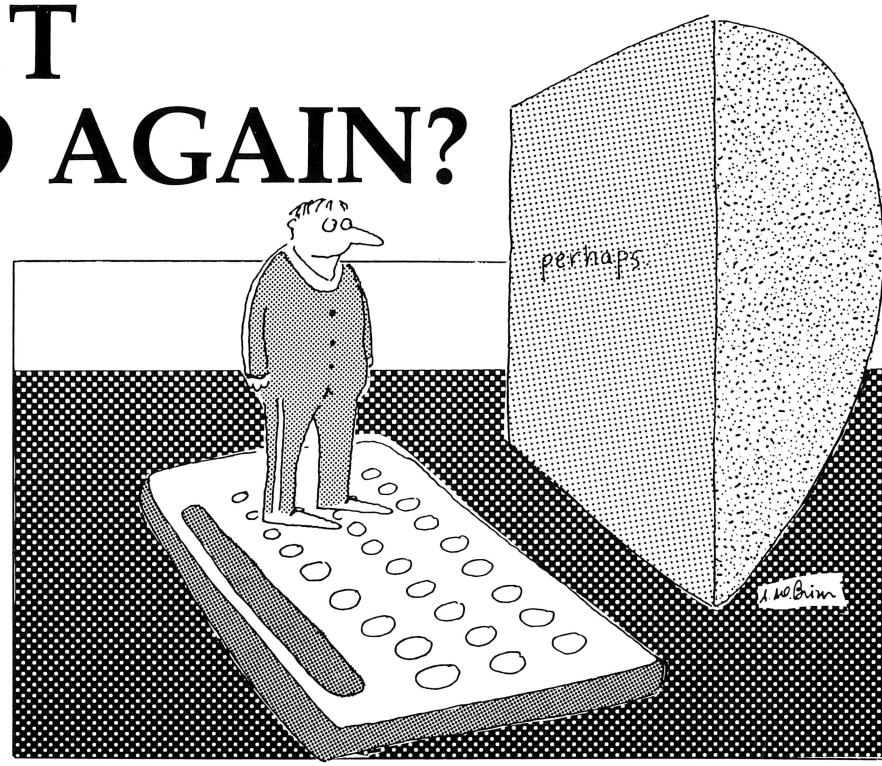
We are also opening up a low-cost way for user groups and individuals to advertise in Epson World. Finnegan's Flea Market will let you advertise (almost) anything you can describe inside a one by two inch box ($50 per issue). The classified section gives you 4 lines for $20 per issue. You can give us your Finnegan ad copy as little as 10 days before EW is mailed from the printers. Contact us at (603) 487-2500 for more details.

We've just installed a bulletin board at (603) 487-2051 for your use. Use it to order your subscription renewals, place your Finnegan ads, send in manuscripts, ask questions, cast poisonous barbs, etc. It has a 20 megabyte hard disk on line, so rummage around...you can never tell what goodies may be lurking about.

Times and Epson World are changing, and I think for the better. Our goal is to provide you with a national forum that draws the Epson community together, making your computing easier, more productive, and perhaps even fun. No hints, but check "After Hours" in our next issue.

Jim Hansen

WHY GET BURNED AGAIN?



Your May edition is replete with pleas by RSI and Chris Rutkowski to buy V+ III. Buy before we die. Last Chance Cafe. Sad. But why should those of us who want a better word processing system have to shell out $350 for a five-foot shelf of accounting and drawing programs that we don't want or need?

I have had two QX-10s since 1983 and never used anything other than the word processor. I suspect this is the case for many QX owners. Indeed, the QX was marketed precisely as a word processor and celebrated as one that could be used right out of the box without costly tutorials or a Ph.D. in computerese. In that sense, it was a splendid machine.

Tragically, Epson and Rising Star, having created a marketing niche and a loyal following, promptly abandoned it for a higher calling, i.e., creating an all-purpose system that would, to borrow a phrase from Garcia Marques, "sew buttons and cure fevers."

If Valdocs 1.18 proved to be slow and indifferent to commands, Valdocs 2 proved to be a disaster; a diskette eater and fountain of error messages. Why then should we burn our fingers on V+ III?

Alfred Pakula
Portland, Maine

Well, I Like It

My compliments on your May issue of Epson World. I'd like to extend my old Epson Connection subscription.

I read Jim Hansen's article, "Build it at Home" with special interest since I began searching last week for a low-cost parallel cable switch for my two printers. Since you covered a serial cable switch in this article, how about following up with a parallel solution?

I liked Richard Shoemaker's approach in "Choosing WordStar" of matching software programs with applications. I have used many of the programs Richard described.

I look forward to future issues of Epson World.

Jim Olney, Jr.
Seattle

On the Other Hand

My first and last issue of Epson World has just arrived.

You state on page 3 of your May issue, "there are at least 35,000 QX owners out there ... and we will continue a strong editorial voice in support of you and your computers." Yet, whatever purpose you purport, three others are seemingly demonstrated and go without mention: 1. Sink RSI, 2. Badmouth Val+, 3. Convert QX-10/16 owners to orphan machine owners, MS-DOS, or both.

Consider a few examples:

1. Mr. Strukhoff states on page 20, "the paper devoted in trade magazines to trashing the QX-10 and Valdocs — based mostly on the system's glacial speed — put warm food in the bellies of many a logger's family." How does Mr. Strukhoff's other article beginning on page 24, "Val?," differ from these? It doesn't.

It is hardly just and has, apparently, the sole purpose of sowing doubt regarding Val+ in the minds of readers — or sinking RSI, for the article is wholly negative to both. Neither deserves it.

Val+ is the best integrated system I have worked with and the personnel at Rising Star among the most cooperative and helpful that I have dealt with in any field.

2. Mr. Hansen is concerned on page 7 with the fiscal integrity of RSI based on a company supported by limited users. Really? Simple arithmetic indicates that sales of Val+ would be adequate to insure the survival of the corporation and the development of new products; i.e., 20,000 Val+ sales would generate almost $7,000,000 in revenues.

3. Mention is also made by Mr. Strukhoff of Richard Shoemaker — president of the National Epson QX-10 User's Group — calling a national boycott of RSI. If he or his members,

Continued on page 42

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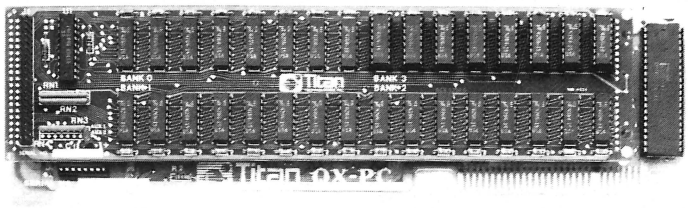

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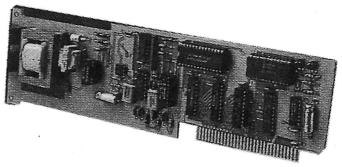

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Circle 8 on Reader Service Card

QX-16 FINDS NEW LIFE

"Sometimes I will, and then again I think I won't." So ran a line from a Chuck Berry hit of many years ago, and so runs the story line of the Epson QX-16. The QX-16 was introduced slightly more than a year ago and was touted for its ability to run Valdocs and CP/M with its trusty Z80 microprocessor and MS-DOS with its Intel 8088 co-processor. It appeared to be Epson's way of accommodating the de facto MS-DOS business computing microcomputer standard, but the machine was dropped in less than six months as Epson moved completely to MS-DOS with its Equity series of IBM PC clones. The QX-16 was liquidated, its price dropped into the basement, and now sales are steady from a number of dealers throughout the country.

New interest in the QX-16 is coincident with the release of Valdocs+ III, the "Valdone" version of the Valdocs computing environment. Epson World has had time to take preliminary looks at V+ III (see article in this issue), and plans to run a Valdocs+ III forum over the next several months, as the nuances of this 10-disk integrated program are discovered. Interest in the QX-16 also brings some hope to the community of stubborn CP/M program developers out there.

Val-Ware Off and Running

Bob Georgius, who along with Steven Kray is leading the effort by Val-Ware Distributors to sell Valdocs+ III, said in mid-June that sales have been strong, but "we need to get the word out even more about Valdocs+ III." Val-Ware Distributors obtained exclusive distribution rights to all Valdocs implementations from Rising Star earlier this year. Val-Ware's primary business right now is selling Valdocs+ III, both by itself and bundled with the QX-16; Georgius said Val-Ware shipped 1,000 Val+ III packages in the first eight weeks of its availability.

The number of QX systems in use is around 50,000, and Georgius hopes the word about Val+ III can reach them all. "Basically, I'm looking at the entire installed base of QX systems as the universe for Val+ III sales," he said.

Val-Ware has sold a number of Val+ III packages to dealers throughout the country, and is also selling Pro System 10- and 20-megabyte hard disks for use with the QX-10 and 16. "We're not advertising this fact right now, but we'll also sell anything from the RSI catalog, from RSI BASIC on up," Georgius added. One product that remains in the hands of RSI, though, is Valdocs 2.03, the third "bug fix" to Valdocs 2. RSI was beta testing Val 2.03 in mid-June, and will work with Epson to distribute it to Valdocs 2 owners.

Driver's Seat

While on the subject of the QX-16, it's instructive to review a critical component, the disk drive. EpsOnLine has featured some discussions about drives, and Epson World receives periodic letters and phone calls from both Equity buyers and new QX-16 owners about what disks work with what drives, what drives read what disks, what drives each system has, etc.

The original IBM PC had a size drive now known as full height, taking up the entire available vertical space on the front of the system. It read single-sided floppy disks. Most disks today are double sided, and the standard MS-DOS floppy capacity is 360K, also designated by the term "double density." Thus, a double-sided, double-density disk is indicated by DSDD. The standard disk drive size today is "half height," as found on IBM PCs and most compatibles, including the Epson Equity series.

The QX-10's drives are "one-third height" drives, reading double-density disks. With the QX-16, Epson installed half-height drives, but they read quad density disks that can hold about 720K of data. (The Tandy 2000 system, an unorthodox system that runs MS-DOS on the Intel 80186 microprocessor, also uses quad density drives.)

The IBM PC AT (and Equity III) feature yet another floppy drive that reads "high density" floppy disks containing up to 1.2 megabytes of data.

Now, a QX-10 one-third height, double-density drive will work in the QX-16, but the 16 really wants quad density, so this is not a particularly good idea. Similarly, the 1.2MB AT-type drives will read 360K disks, but there have been problems when these drives write to such a disk. Quad density drives will read double-density disks, and double-density drives will read old single-density disks. Look for an article in a future issue of Epson World discussing the confusing number of disk options available to the user who wants to shop around. Otherwise, to ensure absolute data incorruptibility, match up the drives you have on your system to the proper disks.

Chris Says ...

Meanwhile, back at Rising Star, things have calmed down a bit, but Valdocs developer and RSI president Chris Rutkowski is not happy by everything he sees. Rutkowski said "paying bills" remains one of RSI's top priorities, but added that RSI is also busy filling back orders for mice and Val+ updates. Rutkowski said there are "very few" customers remaining who ordered the mouse but haven't yet received it, and hoped to complete this task in the

near future. There are between 3,500 and 4,000 back orders for Val+ updates, he said. About 1,000 of those were to have been taken care of by the end of June, according to Rutkowski, with the rest steadily handled as quickly as possible.

Rutkowski had some interesting things to say about events in the past and plans for the future. First, the past. Rutkowski said he had some reservations about an article in the May issue of Epson World (Past, Present, Future, p. 7), written by consulting editor Jim Hansen. Note was made in this article of RSI's extensive cost-cutting late in 1985, including severe personnel cuts, and RSI's marketing strategy was questioned. Rutkowski pointed out that Hansen is an ex-RSI employee (having been layed off), and felt that fact should have been mentioned.

"We're still here, and we're doing better than we were," Rutkowski said. "I didn't like making the layoffs we had to make to keep RSI afloat, but they had to be made."

Rutkowski also had some unfavorable opinions of Epson's recent strategy. "Epson fell on its face (with the QX machines) because there are market niches it just doesn't understand," Rutkowski said.

Rutkowski said RSI and Val-Ware offered to sell Epson 30,000 copies of Valdocs+ III at $50 apiece in mid-May, but the offer was rejected. "I figured, send us the $1.5 million to help us take care of old debts, then send the Val+ copies free to all QX owners, but Epson wasn't interested," Rutkowski said. Rutkowski quoted Gene Kunde, newly appointed general manager of Epson America as saying "software support of the QX is not part of corporate strategy."

Kunde confirmed Rutkowski's latter statement, saying "Epson is not in the software development or marketing business anymore. We're not good at it, and we found it requires a level of after-sale software support that's best left to the developer. We've decided to leave software development for all machines — Equity, QX, PX-8, HX-20, or any system — to software developers."

Kunde could not confirm any price or quantity regarding the offer mentioned by Rutkowski, but he did say "RSI and Val-Ware had talked to Epson about a product which at that time did not exist."

Rutkowski has plans for a future installation of Valdocs on a zippier machine than the QX-10. "The QX-10 is not an old-fashioned machine in terms of architecture, just in terms of the Z80 microprocessor," he said. One option he's looking at is a design from SemiDisk outlined in the products department of this issue of Epson World. This system uses an Hitachi chip and dense circuit design to create an environment "that would run Valdocs 10 times faster than it presently runs," Rutkowski said.

Whatever the plan, it will entail building a new computer, Rutkowski said. "Of course, we need either a developer or the financial backing from someone" to make the project go, he added.

Rutkowski again asserted he is not planning to port Valdocs to the IBM PC. "That would be an exercise in futility," he said. "The IBM PC is well-established as the Model T of the industry ... and I don't mean that cynically. But I'm looking to go beyond that."

Speaking of automobiles, Rutkowski used a few good car analogies to describe Valdocs+ III and the entire Valdocs experiment. When asked "who was the intended audience for Valdocs," he said "the problem we confront is that certain individuals like a Chevy Nova, but (someone else) wants a Porsche. It depends on the freight you're hauling, where it's going, etc." When asked about the well-reported slowness of some Valdocs applications, especially on floppy-based systems, he said, "if you're a professional writer, what do you mean you don't have a hard disk? How about a SemiDisk?" Rutkowski further elaborated that Valdocs becomes many things to many people, but he really thinks it was written "with 95 percent of current computer users" in mind.

A Straight Line

As mentioned in Epson World before, the EpsOnLine electronic user's group, accessible with a modem through the CompuServe information utility, engenders some interesting discussions about QX computing matters. One of the more interesting discussions recently involved the QX-16's monitor. It seemed that a dealer, Bill Stoebig (Compuserve ID 75126,1154) noticed that one batch of QX-16 monitors had model number 612A, while a previous batch had model number 602A. Stoebig noted that the 612As came with the hard-drive versions of the machine.

Super-sleuth Mike Morra (76703,4051), known in the group as an ace detective, eventually found out that the 612 (or Q612) was originally shipped with Epson's QX-11 MS-DOS value-added reseller (VAR) system, but "seems to be functionally the same as the Q602!" Morra theorized that the monitors are identical except for small cosmetic differences.

But two separate manufacturing runs with parts supplied by different manufacturers were apparently made to accommodate the QX-11, a machine that normally has a small, 5-inch monitor. Morra concluded that there should be no problem with either monitor on the QX-16, that "for accounting and billing purposes, a similar product can end up with two codes like that, depending on how they're being marketed and priced."

While getting to the bottom of the QX-16 monitor riddle, Morra also mentioned that there are two keyboards for the QX-16. One has a spongy feel (like the original QX-10 keyboard) and the other has more resistance in the keys, "much like the updated QX-10 keyboard," Morra said.

Equity Strong, Kunde Says

Gene Kunde, general manager of Epson America, said Equity sales "reached record levels in May" and in fact "exceeded the forecast" for that month. Epson follows the traditional industry policy of not releasing exact sales figures, but Kunde said he "is feeling good" about retailers' and the public's perception of the Equity.

Kunde acknowledged that price cutting moves by IBM "have an impact that puts pressure on the (entire) marketplace" and that Epson has reacted by cutting prices of its own systems. But Kunde said Epson has not cut prices "just because of IBM." He also pointed out that Epson "does not (necessarily) want to be known as the price leader" in the MS-DOS marketplace, but rather, customers "should perceive high value in our systems." •

EPSON PRINTER TARGETS BUSINESS

The latest printer offering from Epson America, the EX-800, is a nine-pin dot-matrix printer rated at a top speed of 300 characters per second (cps). Priced at $749, the EX-800 is the first printer from Epson designated with the "EX" prefix. It is aimed squarely at business applications, featuring a color option for business graphics, and IBM printer emulation.

The EX-800 is an 80-column printer with an eight-button typestyle selection panel and Epson's latest paper feeding features. The selection panel has buttons labeled "draft," "pica," "elite," "normal," 'NLQ roman," "NLQ sans serif," "proportional" and "condensed." The EX-800 operates at 54 cps in near-letter quality mode with elite text. For pica text, the printer hits 250 cps in draft and 45 cps in NLQ mode.

Epson America, Computer Products Div., 2780 Lomita Blvd., Torrance, CA 90505, (213) 539-9140.

Circle No. 81

Mastering Communications

Mastercom is the name of a $49 smart terminal and file transfer utility from The Software Store. The software is written to perform four basic functions: turn a micro into a host time-sharing terminal, capture data onto a disk or printer from other computer sources, send files from disk to other systems, transfer files with an error-correcting protocol.

Features include auto dial; auto answer; host mode unattended operation; directory display; batch transfer; wild card file specification; single-key stored responses; filter or ASCII display; on-line selection and revision of communications parameters; and file view, rename and file erase. A number of popular protocols are supported.

The Software Store, 706 Chippewa Square, Marquette, MI 49855, (906) 228-7622.

Circle No. 90

Super Semi

SemiDisk Systems, developer of the popular 512K and 2MB RAMdisk boards for the Epson QX-10, has announced a new product that is designed to be the fastest, most powerful CP/M and Z-system computer ever built, according to SemiDisk president Jim Bell. This is not something that QX-10 or 16 owners would be interested in for their systems, but represents the latest in one area of computer development. Bell stresses that despite this system's 8-bit technology, it is most definitely not a "home brew" computer.

Inspired by the cult classic, Douglas Adam's *Hitchhiker's Guide to the Galaxy,* the system's main board is called Deep Thought 42, or DT42. It has 512K of dynamic RAM, four RS-232 channels, and a floppy disk controller that will handle as many as eight drives of various sizes simultaneously. There is a video interface, SASI channel for high-speed devices, parallel printer interface, and two spare erasable programmable ROM (EPROM) sockets. The system can run at more than 12 megahertz and uses a four-layer printed circuit board.

The co-board is a SemiDisk board with 8 megabytes of dynamic RAM — four times the memory found on the largest SemiDisk for the QX-10 — made out of 256K memory chips. The co-board also will have a voice record/reply capability.

SemiDisk Systems Inc., PO Box GG, Beaverton, OR 97075, (503) 626-3104.
Circle No. 89

Mail Management

Mail-Track-II is an updated version of a mailing list management program from Sapana Micro Software. The program is menu-driven and allows as many as 24 fields to be created for each address. It can print mailing labels in many formats (Avery, Cheshire, etc.) and compile reports as well.

A built-in option, LetterMergeII, allows printing of personalized form letters.

The program can handle as many as 32,766 addresses in a data file. Users can browse through addresses forward and backward in address entry and ZIP/Postal code order. Single or multiple fields may be sorted in major or minor order.

The program will work with a RAMdisk to speed things up.

The price of Mail-Track-II is $95 in the standard, unprotected version. Users may obtain a copy-protected version for $120. The program requires MS-DOS 2.00 or higher and 256K RAM.

Sapana Micro Software, 1305 South Rouse, Pittsburg, KS 66762, (316) 231-5023.
Circle No. 87

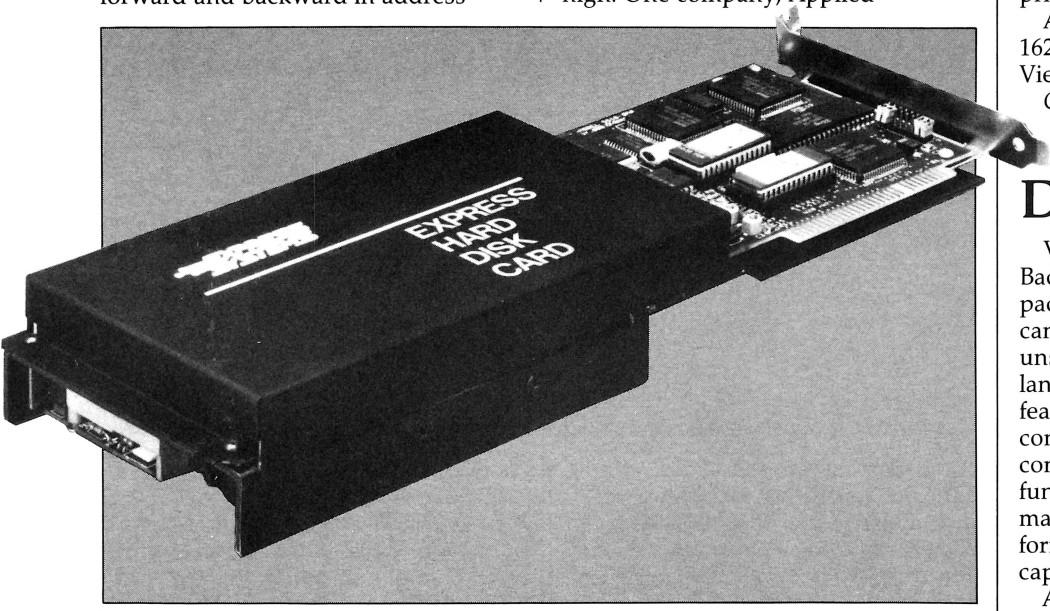
Daily Serial

Local area networks have been touted for many years as a great leap forward for business microcomputer users. The problem is standards are hard to come by and costs remain high. One company, Applied Knowledge Groups, is addressing the latter concern with the Knowledge Network, available for $99 per system. This price may be a bit deceptive, since users need to have a modem installed to run the network. But with a modem, communications can proceed at remote sites as needed.

This network uses memory-resident software, telephone wire and the RS-232 serial interface to accomplish its task. There is no prescribed network topology. Security and data integrity measures include error checking and data acknowledgement, write protection and selective access for printers and disk drives.

By using the RS-232, transmission speeds are quite slow by networking standards, but the manufacturer says Knowledge Network is designed to share hard disks, RAMdisks, tape drives, CD-ROMs and, of course, printers.

Applied Knowledge Groups Inc., 1622 El Camino Real West, Mountain View, CA 94040, (415) 965-1300.
Circle No. 84



Hard Guys

The hard drive board is increasingly prominent in today's microcomputer realm. One of the latest developments comes from Express Systems and its family of seven DiskCards, ranging from 20 to 60 megabytes in capacity and $449 to $1,095 in price. Despite a rather unfortunate choice of names, the boards are fast: Access speeds range from 60 to 80 microseconds, and data is transferred at rates between 5 and 7.5 megabits per second. For an extra $95, a DiskCard can be combined with an existing hard disk as an expansion of that disk; both act as one.

Available for the entry level card is a program called File Compactor, which compresses binary files by 30 to 35 percent, text files 40 to 50 percent, and database files as much as 90 percent.

A data backup program, DS Backup, is free for the asking with all cards.

Express Systems Inc., 1254 Remington Rd., Schaumburg, IL 60195, (800) 341-7549.
Circle No. 85

Don't Talk Back

Version 1.2 of LaSalle Micro's BackComm communications software package is priced at $95. The program can encrypt and decrypt, squeeze and unsqueeze files, and has a "command language" called BackTalk that features 52 commands. The commands provide basic communications, as well as arithmetic functions and evaluation, decision making, disk file read/write, screen formatting, and interfacing capabilities.

A background mode enables BackComm to remain operational while another application is running in the foreground. One example would be to pre-program the software to check on stock markets throughout the day while the user performs other tasks.

The program presents a menu-driven approach, but can be switched to direct commands as the user gains more experience.

The program can use ASCII, X.PC, and variations of XMODEM protocols to establish links.

LaSalle Micro Inc., 1350W Remington Rd., Schaumburg, IL 60195, (800) 882-5171.
Circle No. 86

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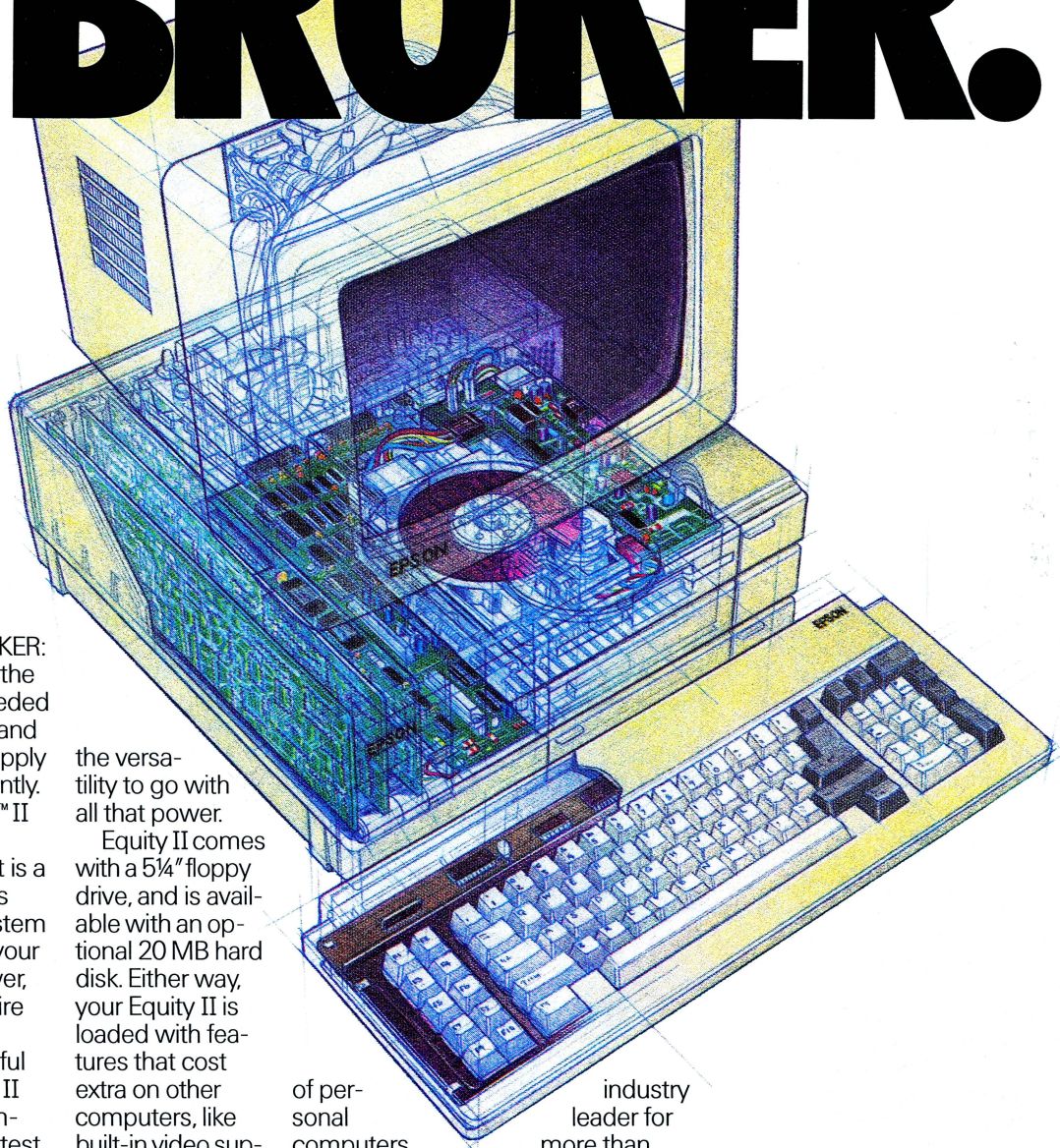

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For those of you with advanced programming skills and business experience or knowledge of an industry, contract programming can be extremely profitable. Most businesses perform unique, repetitive operations for which no standard, off-the-shelf program exists. If the company already owns a computer, it often makes sense for it to hire an outside contractor to produce a software program that performs these unique tasks.

Even with off-the-shelf programs, a company may hire a contract programmer to customize parts of the program to fit its unique needs — or to save time for the owner. For example, the owner of a small business, rather than taking the time to design on-screen forms for the clerical staff to follow when entering data, may prefer to hire an independent contractor to design and enter the screens.

But depending on the programmer's skills, contract programming may also involve problems as complex as analyzing a potential client's business problem and system needs to design a complete, custom computer program or hardware configuration.

Some contract programming, such as writing simple routines or customizing off-the-shelf packages for small businesses, can be done at home. But many large companies require you to program on their premises during normal business hours. You should adjust your marketing strategies with this in mind if you're unwilling to work at the client's place of business. It's been noted that it's often harder to get things to work on large systems because they're less flexible than microcomputers.

> Always work under a contract.

The only way to begin as a contract programmer is to understand at least one computer language extremely well. "The basic qualification is that you're able to do the job," says Dr. Fred Abramson, president of Intellisys, a Sunnyvale, California company that recently developed and introduced a software package for personal computers that simulates and tests the logic of integrated circuit designs. Abramson adds that a broad computer background is equally important: "If you only understand BASIC or dBASE III specifications, you're likely to have some trouble because this limits you quite a bit. It narrows your thinking." Abramson, who holds master's degrees in electrical engineering and computer science as well as a doctorate in mathematics from MIT, worked as a contract programmer to meet expenses while designing the CAE program and organizing Intellisys.

Abramson also notes that a general business or industry background helps a lot: "The client needs your help with a problem, which is why you were called in. It's a process of mutual education: you have to teach the client about computer systems, and the client has to teach you about the company's business problem. You have to be open to learning the language of the company's business and its special problems."

In the 11 years since he started a computer consulting and training

PHOTOGRAPH BY BENJAMIN MAGRO

business in his home, Gopal Kapur, president of the computer training, software development and consulting firm Kapur & Associates in Danville, California, has seen contract programmers and computer consultants come and go. He observes that contract programmers and consultants often go out of business quickly due to a lack of preparation. "They don't establish the proper contacts before starting the business, they don't know who they're marketing to, they don't plan a marketing strategy, and they haven't established a cold-call technique," he says.

Kapur recommends that people planning to become contract programmers not quit their full-time jobs until they've laid the proper groundwork. This involves several months attending professional data-processing association meetings, talking with the people who hire contract programmers, and learning their needs — all the while building a list of contacts for future work.

Kapur also suggests that you spend six months or more subcontracting work through a company that brokers temporary programmers before striking out on your own. "The experience will help you learn marketing techniques and the pricing structure of the industry," he explains.

That's exactly what Cox Ferrall did several years ago when he "saw the handwriting on the wall" while working at a medium-size minicomputer timesharing firm. "The microcomputer and communications technology was surely going to supersede minicomputer technology," he says.

"I initially subcontracted through an established local consulting firm for sources of clients. I felt comfortable using somebody else's security blanket — until I found myself doing the majority of the selling for them. Rather than continuing to give up a large slice of each pie, I launched out on my own," Ferrall says.

Both Ferrall and Kapur stress that if you plan to strike out on your own after gaining initial experience at a "job shop," it's very important to establish a client base independent of the firm for which you're consulting. "Don't take their clients from them," Kapur warns. "It's unethical, and if you do it, you won't stay in business very long. Your references will be bad."

"I call it good manners, not ethics," Kapur says. "But a lack of professional ethics — such as using a client's copier, phones, supplies and contacts for your own marketing — will destroy your professional reputation."

Gopal Kapur offers a few more practical tips for those about to start their first ventures: "You should have enough cash to be solvent for at least six months from the time you go into business. People get into financial trouble, their business judgment gets poor, and they tend to say the wrong things to clients. And it takes 40 to 50 days to get your cash flow going after you start on your first job. I recommend you bank with a small neighborhood bank, because its personnel is likely to be more attentive and responsive. They recognize your name when someone calls for references, and they're understanding during a short-term crisis. It's too late to shop for a banker when you're in trouble."

Target your association memberships to the market you're addressing in your sales program.

You've gone to a few industry meetings, met and impressed a few data-processing managers, and have finally landed your first independent contract. The experts warn that your performance on every job — especially the first one — will make you or break you in this field. "Clients and prospective clients must perceive quality in everything I deliver," Cox Ferrall said when explaining his marketing strategy.

But you must also know how to handle human dynamics when you're a "highly paid consultant" — as all successful contract programmers agree. "Whenever you talk with a large company, you're going to face the political problems of that company," notes Dr. Abramson. "Human beings often require more delicacy than you need to solve a computer problem."

"Many contract programmers alienate regular employees because they brag about the money they're making," Gopal Kapur observes. "You should always keep the feelings of (the client's) employees in mind." Kapur feels that if the contract programmer hears staff programmers griping about the high contract rates, he or she should politely explain that while the hourly rate seems high, there are no benefits or medical insurance — and state disability and Social Security taxes must be paid out of the revenues.

Explain that contracting independently involves other business expenses, such as time spent approaching clients and preparing project proposals. Rates must reflect these hidden costs. "It's also a bad practice to associate only with the managers and to ignore the staff (programmers)," Kapur says.

CONTINUING EDUCATION

Long-time, successful contract programmers stress the need for continuing technical training while programming and consulting on a contract basis. "Too many new contract programmers fail to keep up on their education," says Gopal Kapur. "They don't attend industry meetings where they might meet contacts for future contracts, they fail to subscribe to industry publications and they refuse to pay for training. They don't realize that they have to read more and be sharper than a regular employee.

"You should keep up with the industry," he continues. "If you can't afford special seminars, at least attend continuing education courses at public community colleges, which aren't too expensive." Cox Ferrall notes that associating with your peers can help you avoid costly mistakes: "Perhaps the biggest danger in working for yourself is the incredible number of wheels which any one person can reinvent," he says. "Until I joined a couple of sophisticated user's groups, I was constantly writing algorithms and discovering bugs that other people already knew about and had solved."

Target your association memberships to the market you're addressing in your sales program. Many of these associations also conduct professional training and certification programs. The Data Processing Management Association (DPMA), for example, has a certificate program that certifies a programmer's level of competency based on annual examinations. Association newsletters provide valuable information for your

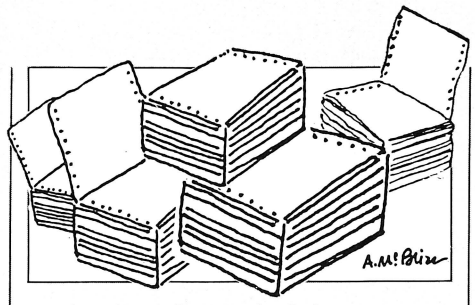
Some Major Industry Organizations

While you may obtain information on membership applications and local activities of these organizations from the headquarters offices listed below, first check your telephone book for local chapters.

ADAPSO (Association of Data Processing Service Organizations), 1300 N.17th St., Arlington, VA 22209, (703) 522-5055.

AEA (American Electronics Association), 2670 Hanover St., P.O. Box 10045, Palo Alto, CA 94303, (415) 857-9300.

AFIPS (American Federation of Information Processing Societies), 1815 N. Lynn St., No. 800, Arlington, VA 22209, (703) 558-3660. Constituent Societies:



- American Society for Information Science
- American Statistical Association
- Association for Computational Linguistics
- Association for Computing Machinery (ACM)
- Association for Educational Data Systems
- Data Processing Management Association (DPMA)
- Institute of Electrical & Electronics Engineers (IEEE)
- Instrument Society of America
- Society for Computer Simulation
- Society for Industrial & Applied Mathematics
- Society for Information Display

IPIP (International Personhood of Iliterite Programmers), P.O. Box 386, Danville, CA 94526, (415) 837-0397.

Contract programmers specializing in certain applications should also join the industry associations for that application, such as the American Payroll Association and Internal Auditor's Association if you specialize in accounting programs. — *L.G.*

work, and member directories are an excellent source of sales leads, as are conferences and other activities the organizations sponsor. Their political lobbying activities benefit their industries as a whole, and — as with IPIP (the International Personhood of Iliterite Programmers) — you can even have fun with your peers. IPIP Hooray!

MARKETING

Successful contract programmers all agree that contacts made at professional society activities are the best source of sales leads. "There's nothing better than giving speeches and writing articles in your area of expertise," says Gopal Kapur. "Later, your phone calls and sales presentations aren't cold calls. They give you exposure to your market and access to your potential client." Cox Ferrall simply notes that "you have to network the hell out of (trade associations)."

Kapur points out a frequent error programmers make once they get their first job: "They devote all their time for six to eight months to the project; the project ends or it gets cancelled, and they don't have any new business. It's important to market continuously, even when you're working on a job, and to keep your contacts fresh."

A professional image is the most fragile but most important aspect of marketing yourself as a contract programmer. "It's impossible to spend too much on your business cards and stationary," says Cox Ferrall. "You're too small to not look like a quality organization." While echoing Ferrall's comments ("the business card shouldn't be flashy or overbearing, but professional"), Kapur adds that many technical people can't really write clear letters, which are important in the initial sales process and ongoing client contact. "If you write poorly, find a part-time executive secretary who can edit your letters, drafts and memos for grammar and punctuation," he advises. "When the times get rough, it's the polish that makes the difference."

> Proper documentation is always a sticky issue.

One other word of advice: Don't use a company name that's so creative no one can pronounce it.

Contract programmers charge from $20 to $100 per hour, depending on the prevailing rates in the geographical area, the level of complexity of the job, and technical knowledge necessary to do the work. "If you're a one-dimensional guy — a programmer who lacks applications expertise — you can charge from $20 to $40 an hour depending on local market conditions," says Cox Ferrall. "If you're an experienced programmer-analyst — someone with more education, experience and knowledge of the specific application — you can charge from $50 to $100 per hour." The trick here is that the final cost to the client is normally about the same whether using a tyro or pro because of the faster speed at which the more experienced programmer works.

Gopal Kapur recommends you find out what the typical contracting house charges for your level of expertise in your area, and then charge 20 percent less. "If you price yourself too low, you'll seem too inexperienced to do the job," he notes. "But if you price yourself too high, you'll price yourself out of a job."

If you're working out of your home,

don't make excuses or pretend you have a regular office apart from your living quarters. "The client will find out, and you'll lose a part of your professional image," Kapur warns. "There's nothing wrong with having a home office — when I first started out and worked out of my home, I used to tell the clients it was a great thing — the commute is only 22 steps!"

Kapur recommends you install a separate phone line for business calls to your home. "And don't let the kids answer the business line," he says. "They may sound cute to you, but they're annoying to the client." Don't make long personal calls, which would frustrate a client trying to reach you during business hours.

"With answering machines in widespread use now, an answering service isn't really necessary," Kapur adds. "But keep your outgoing message short and businesslike, nothing so creative it sounds way out to a client."

CONTRACTS

Always work under a contract. "If the client is leery of signing a contract, you'll probably have trouble collecting payment too," Cox Ferrall observes. Gopal Kapur says that large companies always have you sign their own contract. If it's for more than $500, have an attorney review it. If it requires outlays for insurance or equipment before you begin work, try to have the client pay the expense or get a written waiver.

When drafting your contract, it's important to stipulate levels of performance and definitions of performance warranties. "When I was first starting out," Ferrall says, "I found myself obligated for data-entry work on a 3,000-record master file because I had failed to pin the client down on his definition of 'setting up a database.' " Kapur notes that while it's fine to exclude the normal variances of life from your contract, it's important to stipulate the hours and performance level expected to fulfill the contract at fixed times through the term of the agreement.

It's important to stipulate who retains rights to the software when the job is finished. Most large companies require a "work for hire" contract, which means they own all rights to the product when completed. You have to stipulate clearly that you have marketing rights to the product if you want to resell it later. But — at least under California law — if you've been contracted on a "work for hire" agreement, the client must pay state disability and unemployment compensation taxes for you during the term of the contract, and this gives you leverage to negotiate other rights to the product.

You're skating on thin ice if you don't have a rights agreement at the outset. Dr. Abramson, for example, avoided contracting on projects related to the product he was developing as the cornerstone for Intellisys. Most companies and contract programmers consider it a breach of ethics — which will damage your professional reputation seriously — to remarket a program you've produced under contract for another firm without its knowledge. "It's always nice when moral issues can be resolved on economic grounds," notes Cox Ferrall. "When a programmer puts together a program for a firm, he is solving the problem of only one company. If he then brings the product to market it's based on a sample size of one, and this is rarely successful. If the programmer wants to produce a truly valuable, marketable program, he should arrange to test it at several companies in the industry." In the industry, this is called Beta Testing a product.

> The only way to begin is to understand at least one computer language extremely well.

It is, however, possible to obtain rights waivers. For example, Kapur & Associates is now marketing a $25,000 software development methodology called the Kapur Method 2000, which was developed under a variety of contracts for different clients. Kapur, however, fully informed his clients that he planned to introduce the product to the market and received rights waivers in exchange for initial price discounts for the Beta Test sites.

Proper documentation of your work is always a sticky issue that should be included in the contract. "The users always want extensive documentation until they're told how much it costs to produce it," notes Cox Ferrall. But proper documentation is critical for the people who use and maintain the system: "A company may not think it needs it, and underestimates the importance of proper documentation," Dr. Abramson observes. "But a company should be willing to pay an extra 10 to 20 percent to get the true value of the product through proper documentation."

Your contract should clearly stipulate and define the documentation that you will deliver with the software: operating instructions, data-entry instructions, user manuals or whatever.

Your contract should also stipulate what forms of support you will offer the client after the software is delivered. Cox Ferrall delivered a program to a religious order that computed the special state and federal withholding taxes and reports which the order negotiated with the governments. "No off-the-shelf program could adequately manage the revenues and governmental reporting, so I designed a series of dBASE II programs that solved their problems," he says. "But now I have to modify the programs or write new routines every time they realize they've overlooked something — or when government regulations change."

While this happens frequently, support also becomes a moral and ethical issue: "Ethically, a programmer should never use sloppy or convoluted code as a source of ongoing business," Ferrall stresses. "Every reputable programmer is responsible for delivering clean, structured programs. But the question arises: How strong is this obligation if the client refuses to pay for it?"

Gopal Kapur also stresses that high-quality software is a hallmark of professionalism — and critical to your marketing efforts. But, he adds, you should stipulate terms, conditions and charges for post-delivery support in your contract. "You can charge a little more, because the interruptions are frequent, but the work isn't as steady as building the original system."

So if you're a hot-shot programmer, go out and learn an application, find some clients, get them to sign your contract, and go to work. Remember: One of the benefits of being self-employed is that you're working for one idiot, not a hundred of them.●

COVERING THE BASES

Balance your checkbook in octal with GW-BASIC.

By Alan L. Zeichick

Computers and numbers are like coffee and donuts — they go well together. Not just the ordinary counting numbers like 1, 2 and 3, but also the special numbering systems used by computers and their programmers.

The Arabic arithmetic system, which we use today, is based on 10 digits, following the lead of our hands. There's nothing special about ten, it's just convenient. But some ancient Middle Eastern and Native American civilizations found other bases much more practical — some used 12 digits, others used 60.

Why? It's a matter of simple division. The number ten has two factors, or numbers that can be divided evenly into it: 2 and 5. Twelve has four: 2, 3, 4 and 6. Sixty has 10: 2, 3, 4, 5, 6, 10, 12, 15, 20 and 30. So, if arrowheads or warriors are counted in units of 12 or 60, and there's a need to divide the group, the answer is easy to obtain with a larger arithmetic base.

COMPUTERS COUNT

As we all know, computers work with ones and zeros — ons and offs. These correspond to the values of individual segments, or *bits* of computer memory. Those two simple values, 1 and 0, are used everywhere throughout a digital computer, singly and in combination, for programs and data. This two-valued numbering system is called *binary* or *base 2.*

Most people now use the Arabic system, called *decimal* or *base 10.* Even though the computer uses binary, we find decimal numbers like 105 more convenient to deal with than the binary equivalent, 1101001.

But sometimes binary numbers must be used, such as when working with character-conversions or other technical applications. In those times, two shortcut formats called *octal* (base 8) and *hexadecimal* (base 16) often come in handy.

Octal has eight possible digits: 0, 1, 2, 3, 4, 5, 6 and 7. Hex, as hexadecimal is usually abbreviated, has the same followed by 8, 9, A, B, C, D, E and F. "A" signifies the decimal value ten, "B" is 11, etc.

These "shortcut" bases have a close relationship with binary. Every three binary values correspond to one octal digit, and every four to one hex digit, as seen in Table 1. So, the binary number 11010111 can be broken down to three groups of three (011 010 111) or two groups of four (1101 and 0111) — which correspond to octal 327 and hex D7.

Microcomputers normally use

Table One: The first 16 values in binary, octal, decimal and hex.

Binary	Octal	Decimal	Hexadecimal
0000	0	0	0
0001	1	1	1
0010	2	2	2
0011	3	3	3
0100	4	4	4
0101	5	5	5
0110	6	6	6
0111	7	7	7
1000	10	8	8
1001	11	9	9
1010	12	10	A
1011	13	11	B
1100	14	12	C
1101	15	13	D
1110	16	14	E
1111	17	15	F

```
1000 ' Base Converter
1010 ' Alan L. Zeichick for Epson World
1020 '
1030 ' Set up system variables
1040 '
1050 GOSUB 1290
1060 '
1070 ' Set up the display
1080 '
1090 GOSUB 1500
1100 '
1110 ' Get the input string
```

But it's interesting to note that the need to convert between decimal, octal and hex is supported by the GW-BASIC functions OCT$ and HEX$. The accompanying program can be used as a general-purpose base converter.

AUTO CONVERSION

Converting between bases is an important mathematical function. And, while building a BASIC program for "universal" conversion, it becomes an interesting computer problem.

The CONVERT program automates the process of converting numbers between the bases of binary and hexadecimal. Input values can be entered in any of 15 bases, and the conversions will be made for all bases in that range.

The program is easy to operate. When CONVERT is run, the top of the screen will show the *input base,* which defaults to binary, or base 2. To change this base, press the Escape hexadecimal when examining memory constants; octal is infrequently used, favored only by some minicomputer manufacturers.

```
1120 '
1130 GOSUB 2040
1140 '
1150 ' Do conversion, print results
1160 '
1170 GOSUB 2230
1180 '
1190 ' Reiterate
1200 '
1210 GOTO 1130
1220 '
1230 ' ================================
1240 ' ========== SUBROUTINES =========
1250 ' ================================
1260 '
1270 ' Initialize variables
1280 '
1290 DEFDBL A-B, D-Z
1300 DIM EXPONENT(40), NUM.VALUE$(16),
     NAME.BASE$(16)
1310 '
1320 FOR COUNTER.VALUE = 0 TO 15
```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```
1330 READ NUM.VALUE$(COUNTER.VALUE)
1340 NEXT COUNTER.VALUE
1350 DATA 0, 1, 2, 3, 4, 5, 6, 7, 8, 9,
     A, B, C, D, E, F
1360 '
1370 FOR COUNTER.BASE = 2 TO 16
1380 READ NAME.BASE$(COUNTER.BASE)
1390 NEXT COUNTER.BASE
1400 DATA " Binary",,,,,," Octal",,"
     Decimal",,,,,," Hexadecimal"
1410 '
1420 CHAR.VALUE$ = "0123456789ABCDEF"
1430 INPUT.BASE = 2
1440 RETURN
1450 '
1460 ' ================================
1470 '
1480 ' Set up the screen
1490 '
1500 CLS
1510 KEY OFF
1520 LOCATE 1, 1, 0
```

key until the desired input base appears on the line.

After the right base is selected, enter the proper number and press Enter. The numeric equivalent in all bases will be displayed below. When entering the input values, CONVERT only accepts valid digit combinations: 0 and 1 for binary, 0 through 7 for octal, 0 through F for hex. If a mistake is made while typing, convert the erroneous number by pressing Enter so you can start over.

To end the program, press Enter without keying an input value.

START WITH DECIMAL

The actual process for converting numbers between bases takes two steps: converting the number to decimal (required to use BASIC's arithmetic functions), then from decimal to any other desired base. These steps are handled by the subroutines at lines 1960-2000 and 1680-1900, respectively.

The method for converting a number to decimal takes only four steps:

Step 1: Initialize, or start, the

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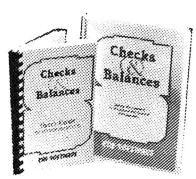

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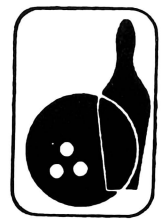

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decimal number at 0.

Step 2: For each digit in the input number, go through steps 3-4, left to right.

Step 3: Multiply the decimal number by the input base.

Step 4: Add the value of the input number's digit to the decimal number.

Using that algorithm, let's convert the value 4B2 in hex to decimal:

Step 1: Set the decimal number equal to 0.

Step 2: There are three digits in 4B2 hex, so let's go through steps 3 and 4 three times.

Step 3: Multiply the decimal number by 16 (hex is base 16) which equals 0.

Step 4: Add the first digit of the hex number to the decimal number, which yields 4.

Step 3: Multiply the decimal value by 16, yielding 64.

Step 4: Add the second digit of the hex number. It's "B," which is the equivalent of 11; so the decimal number equals 64 + 11, or 75.

Step 3: Multiply the decimal value by 16, yielding 1,200.

Step 4: Add the last digit of the hex number, which is 2.

So 4B2 in hex is 1,202 in decimal.

The decimal-conversion subroutine is only a little more complex, partially because the input number is a string constant (necessary since it might use the letters A-F). It combines steps 3 and 4 into a single statement (line 1980), and uses a string-lookup function to determine that B has the value 11.

> Going from decimal to another base is more complicated.

AND BACK AGAIN

The reverse operation, going from decimal to another base, is more a little more complicated. Let's start with the algorithm, realizing that the decimal number is a numeric constant, and the output number will be a string.

Step 1: Initialize the output number to the null string. We'll assume that the decimal value will never be zero.

Step 2: Determine the order of magnitude of the output number.

```
153Ø PRINT "*** BASE CONVERTER ***"
154Ø PRINT
155Ø PRINT "Input Base: "
156Ø PRINT "Input Value:"
157Ø '
158Ø LOCATE 23, 1
159Ø PRINT "Esc - Change Input Base Null - Exit";
16ØØ RETURN
161Ø '
162Ø ' ================================
163Ø '
164Ø ' Convert from decimal
165Ø '
166Ø IF DECIMAL.VALUE = Ø THEN OUTPUT.VALUE$ = "Ø"
     : GOTO 188Ø
167Ø IF DECIMAL.VALUE = -1 THEN OUTPUT.VALUE$ =
     "Decimal Overflow" : GOTO 187Ø
168Ø '
169Ø WORKING.VALUE = DECIMAL.VALUE
17ØØ MAGNITUDE = INT (LOG(WORKING.VALUE) / LOG
     (OUTPUT.BASE))
171Ø '
172Ø EXPONENT(Ø) = 1
173Ø FOR COUNTER.EXPONENT = 1 TO MAGNITUDE
174Ø EXPONENT(COUNTER.EXPONENT) =
     EXPONENT(COUNTER.EXPONENT-1) * OUTPUT.BASE
175Ø NEXT COUNTER.EXPONENT
176Ø '
177Ø OUTPUT.VALUE$ = ""
178Ø '
179Ø FOR COUNTER.DIGIT = MAGNITUDE TO Ø STEP -1
18ØØ TEMP = INT (WORKING.VALUE /
     EXPONENT(COUNTER.DIGIT))
181Ø OUTPUT.VALUE$ = OUTPUT.VALUE$ +
     NUM.VALUE$(TEMP)
182Ø WORKING.VALUE = WORKING.VALUE - TEMP *
     EXPONENT(COUNTER.DIGIT)
183Ø NEXT COUNTER.DIGIT
184Ø '
185Ø IF LEN(OUTPUT.VALUE$) > 5Ø THEN OUTPUT.VALUE$
     = "Overflow"
186Ø IF LEFT$(OUTPUT.VALUE$, 1) = "Ø" THEN
     OUTPUT.VALUE$ = RIGHT$(OUTPUT.VALUE$,
     LEN(OUTPUT.VALUE$)-1)
187Ø OUTPUT.VALUE$ = SPACE$(52 -
     LEN(OUTPUT.VALUE$)) + OUTPUT.VALUE$
188Ø RETURN
189Ø '
19ØØ ' ================================
191Ø '
192Ø ' Convert to decimal
193Ø '
194Ø DECIMAL.VALUE = Ø
```

```
195Ø FOR COUNTER.DIGIT = 1 TO LEN(INPUT.STRING$)
196Ø DECIMAL.VALUE = DECIMAL.VALUE * INPUT.BASE +
     INSTR(CHAR.VALUE$, MID$(INPUT.STRING$,
     COUNTER.DIGIT, 1)) - 1
197Ø NEXT COUNTER.DIGIT
198Ø RETURN
199Ø '
2ØØØ ' ================================
2Ø1Ø '
2Ø2Ø ' Get the input string
2Ø3Ø '
2Ø4Ø LOCATE 3, 15: PRINT INPUT.BASE; " ";
2Ø5Ø LOCATE 4, 15:PRINT SPACE$(33);
2Ø6Ø LOCATE 4, 15
2Ø7Ø CHAR.TEST$ = LEFT$(CHAR.VALUE$, INPUT.BASE)
2Ø8Ø '
2Ø9Ø INPUT.STRING$ = ""
21ØØ INPUT.CHAR$ = INKEY$
211Ø '
212Ø IF INPUT.CHAR$ = "" THEN 21ØØ
213Ø IF INPUT.CHAR$ = CHR$(27) THEN INPUT.BASE =
     ((INPUT.BASE - 1) MOD 15 + 2):GOTO 2Ø4Ø
214Ø IF INPUT.CHAR$ = CHR$(13) THEN RETURN
215Ø IF INPUT.CHAR$ >= "a" THEN INPUT.CHAR$ =
     CHR$(ASC(INPUT.CHAR$) - 32)
216Ø IF INSTR(CHAR.TEST$, INPUT.CHAR$) <> Ø THEN
     PRINT INPUT.CHAR$; :INPUT.STRING$ =
     INPUT.STRING$ + INPUT.CHAR$: IF
     LEN(INPUT.STRING$) > 5Ø THEN RETURN
217Ø GOTO 21ØØ
218Ø '
219Ø ' ================================
22ØØ '
221Ø ' Do conversion & print results
222Ø '
223Ø IF INPUT.STRING$ = "" THEN LOCATE 23,1,Ø:PRINT
     "Done":END
224Ø IF INPUT.BASE = 1Ø THEN DECIMAL.VALUE =
     VAL(INPUT.STRING$) ELSE GOSUB 194Ø
225Ø IF DECIMAL.VALUE < 1E+14 THEN DECIMAL.VALUE$ =
     STR$(DECIMAL.VALUE) ELSE DECIMAL.VALUE = -1
226Ø '
227Ø LOCATE 7, 1
228Ø '
229Ø FOR COUNTER.BASE = 2 TO 16
23ØØ OUTPUT.BASE = COUNTER.BASE
231Ø GOSUB 166Ø
232Ø IF COUNTER.BASE = INPUT.BASE THEN COLOR Ø, 7
233Ø PRINT "Base"; COUNTER.BASE, OUTPUT.VALUE$;
     NAME.BASE$(COUNTER.BASE)
234Ø COLOR 7, Ø
235Ø NEXT COUNTER.BASE
236Ø RETURN
```

That can be found by the expression *int(log(decimal)/log(base))* — more on this later. The magnitude is one less than the number of digits in the output number.

Step 3: Loop through steps 4 to 6, going from the magnitude down to zero. Let's call the loop counter the *exponent.*

Step 4: Divide the decimal number by the base raised to the exponent. Take the integer part of this number

There's nothing special about base 10 — it's just convenient.

— it's the next digit for the output number.

Step 5: Append the value calculated above to the output number's string.

Step 6: Multiply the value calculated in step 4 by the base raised to the magnitude and subtract it from the decimal number.

That's not as bad as it seems! Let's run through it again, reversing the base conversion performed earlier. The base will be 16, and the decimal number starts out at 1,202.

Step 1: Set the output number equal to a " ".

Step 2: The output number's magnitude is calculated by *int(log(1202)/log(16),* which reduces down to *int(7.07/2.77)* to *int(2.56)* to 2. The output number will have three digits, which is one more than the magnitude.

Step 3: Go through steps 4-6 three times, with *exponent* starting off at 2.

Step 4: Divide 1,202 by 16 raised to the second power (16 squared). That's 1,202/256, or 4.70. The integer portion of this is 4.

Step 5: Append this number to the output string, yielding "4."

Step 6: Multiply 4 by the base raised to the magnitude, which is 4 * 256 or 1,024. Subtract that from the decimal number; that's 1,202 - 1,024, or 178.

Step 4: Divide 178 by 16 raised to the first power — that's plain old 16. So, 178/16 equals 11.13; the integer portion is 11.

Step 5: Append this number to the output string. The string equivalent of 11 is "B," so the output number is now "4B."

Step 6: Multiply 11 by the base

raised to the magnitude, which is 11 * 16, or 176. Subtract that from the 178, leaving 2.

Step 4: Divide 2 by 16 raised to the zeroth power — and any number raised to zero equals one. So, 2/1 equals 2.

Step 5: Append this to the output string, yielding "4B2."

Step 6: Subtract 2 from 2, giving 0.

So, the hexadecimal equivalent of 1,202 is 4B2, which matches the results found in the previous section.

The program subroutine between lines 1680 and 1900 looks very different than the simple algorithm above. That's because the limitations of GW-BASIC make it difficult to implement some of the functions we need.

Step 1's assumption that the decimal number will never equal zero is important to step 2, which uses logarithms — taking the logarithm of zero is a forbidden operation. So that condition is tested for in line 1680. Earlier in execution, the program checks to see if the decimal value is too large to be accurate, and if so sets it to -1. Line 1690 checks for that flag, and returns the string "Overflow" if necessary.

Calculating the order of magnitude is a tricky operation. By *order of magnitude,* we want to know the largest number in the output base.

To digress, numbers in the decimal system can be written as *a*10^2 + b*10^1 + c*10^0 etc. The number 423 in decimal is 4*10^2 (400) + 2*10^1 (20) + 3*10^0 (3). As a matter of fact, writing "423" is a shorthand method of writing out that long equation.

Similarly, a three-digit number in hex is *a*16^2 + b*16^1 + c*16^0. All our conversion algorithm does is calculate the constants *a, b* and *c.*

But first the number of digits has to be determined. We know that a three-digit decimal number will be between 10^2 and 10^3. Similarly, a three-digit hex number will be between 16^2 and 16^3.

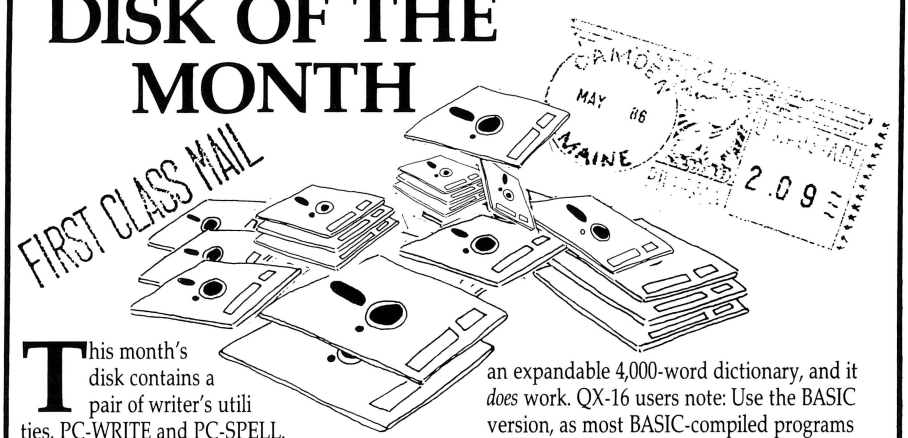
The magnitude therefore can be written as *16* ^ mag = number, where mag will be one less than the number of digits. Taking the logarithm (to any base) of both sides yields *mag * log(16)* = log(number). Dividing both sides by log(16) gives us the final formula for the magnitude, *mag* = log(number)/log(16), or the general form, *mag* = log(number)/log(base). And that's the method used in step 2 above and line 1720 of the CONVERT program.

A problem occurs when raising numbers to powers, as done in step 3 above. Throughout the program, all critical variables are carried in double-precision, as defined in line 1310. But BASIC's exponentiation function returns single-precision values, even if both arguments are double-precision. That's not good enough — imprecise values can lead to erroneous conversions when eight or nine-digit numbers are involved. So, the loop at lines 1740-1770 creates our own, more accurate exponentiation table: *exponent(9)* = base^9.

Now that that's settled, line 1820 represents step 4. The value calculated, which is the next digit for the output string, is assigned to the variable *temp.*

Step 5, appending the character representation of this value to the output string, is handled by line 1830.

DISK OF THE MONTH



This month's disk contains a pair of writer's utilities, PC-WRITE and PC-SPELL. Unless otherwise indicated, these programs will satisfactorily execute on the Epson QX-10 with Titan board, QX-16 MS-DOS, and all Epson Equity systems.

PC-WRITE.ARC — This is perhaps the best public domain word processor program available.

PC-SPELL.ARC — This is a spelling proofreader program that works with most any editor. Although not nearly as sophisticated as commercial proofreaders, this one does contain an expandable 4,000-word dictionary, and it *does* work. QX-16 users note: Use the BASIC version, as most BASIC-compiled programs hang when returning to DOS.

ARC.EXE — The archive utility extracts the member files from the ARC files. It can also create ARC files.

PRINT.EXE — A printer-selection matrix developed by Epson World editor J.D. Hildebrand that prompts you with some of the more important questions concerning selection the right printer for your needs, analyzes your responses and makes recommendations. Not an infallible guide, but it can provide a rough measure of your needs. It's fun, too.

__YES! Send me ___ copies of the first Epson World Disk of the Month (DOM1). I enclose $15 for each copy.

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Signature _____

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Address _____

City/State/Zip _____

Send to: Epson World DOM, PO Box 250, Highland Mill, Camden, ME 04843

These public domain programs are provided on a 5.25-inch diskette and include instructions for loading. The price of $15 per disk includes shipping and handling.

The character representations are in the string array *num.value$* as assigned earlier in the system initialization routine, lines 1340 to 1370. There's a one-to-one correspondence between numeric values and string equivalents: *num.value$(11)* = "B."

Line 1840 implements step 6. Again, our artificial *exponent* array is used instead of BASIC's built-in exponentiation function.

The last part of the conversion subroutine, lines 1870-1890, properly formats the output value into a right-justified string 50 characters long — ample for most purposes.

STRING READING

Getting numbers into the program for conversion is handled by the input routine at lines 2060 through 2190.

The range of allowable digits is stored in the array *char.test$*, which is a subset of the first 16 digits found in *char.value*. If the base is 2, then the first two digits are allowed (0 and 1); if the base is 13 then the first 13 are allowed (0-9 and A-C).

Line 2120 reads a character from the keyboard; if none was read, line 2140 goes back for another. If the Escape key was pressed (ASCII value 27), the input base is incremented in line 2150.

Line 2160 tests for a carriage return, which indicates that the input number is complete and ready for conversion. The lower-case letters "a" through "f" are translated to their upper-case equivalents by the *IF* statement in line 2170.

The acid test is performed in line 2180. If the character input is in *char.test$*, it will be appended to the input string *in$* and printed. If not, it's ignored.

The output subroutine between lines 2250 and 2380 takes the value created by the input routine and calls the two base-converting algorithms, as needed.

Line 2250 ends the program if no input number was given. Line 2260 handles the calls to the subroutine that converts numbers to decimal — if the input number is in base 10, the built-in VAL function will work fine.

A test for accuracy is performed in line 2270: If the decimal number has 15 digits or more, then the accuracy of its least-significant digits are suspect. So, it's changed to -1 to indicate *decimal overflow*.

The program loop between lines 2310 and 2370 calls the second base-conversion subroutine for each of the bases 2-16 and displays the results. The original base is highlighted in reverse video; if the number displayed matches the original input number, then the conversions are accurate.

KEEP ON PLAYING

Using CONVERT's routines, a number of interesting programs can be developed:

- A program that performs addition, subtraction, multiplication and division on numbers of any base.
- A program that generates base-conversion tables similar to Table 1.
- A program that creates arithmetic tables for any base.

Don't be limited to one numeric base. Live a little: Balance your checkbook in octal, convert telephone numbers to binary.●

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RAMPING UP

Using Valdocs+ II with a SemiDisk is a good move.

By Bruce Harrison

It's well worth pointing out at the start of any discussion of the SemiDisk that this board is not for everyone. QX-10 users with large text files may well find that the storage capacity of a hard disk drive has advantages over the smaller capacity of the RAMdisk approach of the SemiDisk. The speed of a hard disk will come close to that provided by a RAMdisk and it will provide far more storage for files in TPM, CP/M and MS-DOS (if you have a Titan board) — something the SemiDisk just cannot do.

That said, if you're still in the dual floppy drive world, use Valdocs+ II as your word processor of first choice, and have a collection of small files easily handled or stored on floppy disks, then the speed and workspace provided by a battery backup 2-megabyte SemiDisk will make Valdocs an even greater pleasure to use.

Notice I said 2-megabyte SemiDisk. I'm tickled pink that I got the larger option rather than the 512K version. With four times the capacity (and users are always amazed at how their work always seems to fill the space available) at a price premium of less than 70 percent, the 2-megabyte SemiDisk is worth its weight in gold.

FIRST OFF ...

With a 2-megabyte RAMdisk installed in your own QX-10 you'll never have to contend with swapping disks, utility or help disks again. The only time you'll be swapping disks is to back up files just in case the power to the board is interrupted for six hours or more, or to archive inactive files off to floppy disks for storage purposes.

Your system will load in less than 50 seconds from power-on. All the Valdocs modules will be available to you without changing disks — even Valdraw and Valpaint, if you have them. Transferring pictures and graphs to the Editor will be almost effortless.

If you occasionally use other CP/M or TPM programs, they can be loaded too, ready to use without a disk change if you like. Be aware that some CP/M programs will not operate completely — or at all in some cases — under "raw" TPM, when you've exited to TPM from the Valdocs menu key. Other CP/M programs will not run quite correctly when selected from the Valdocs menu of applications option under the menu key, because Valdocs is still resident and in control in the background while the CP/M application is running.

> Transferring pictures and graphs to the Editor will be almost effortless.

A case in point is the Indexer Utility provided with the CP/M 2.25 release from Epson. When run from raw TPM, the arrow keys will not function correctly, but the space bar and return keys will allow you to scan through a directory display. But if run from within Valdocs as an application, the arrow keys will work. In either case you will have to press "H" instead of the Help key, and only user area 0 listings will be displayed on non-default drives, regardless of your user area selection. To display user areas other than 0, it's best to log on to the drive of the user area you wish to display, then run INDEXER.COM.

You will have to experiment a bit to find out which CP/M programs run correctly under raw TPM-III or with Valdocs still in the background. When arrow keys or special HASCI keys are inoperative there are usually other keys that will accomplish the same thing.

INSTALLATION AND AFTER

The directions for installing the SemiDisk board are easy to follow. From there you boot Valdocs normally. You will notice that Valdocs+ II will automatically acknowledge the presence of the RAMdisk board and load the index overlay file into it as it initializes the system. If you have the spreadsheet and editor overlay files on your load disk, they will also be automatically placed into RAM along with the index overlay. You do not need to have them on your load disk, however, to set up your system for use with the 2-megabyte SemiDisk board. (Users with the 512K SemiDisk will have three overlays on the load disk.)

Once Valdocs has loaded, simply press the Copydisk key and select the <N>on-Indexed Copy, Delete option. Copy all of the contents of Drive A to Drive MO. (Select <M>ore than one and press the Retrieve key to make it easier.) Once the copying has finished, repeat the process for the Run 2 disk, the Load disk, the Valdraw and Valpaint disks if you have them, and optionally, the Utilities disk if you make frequent use of any of its programs.

To be sure, there is plenty of room to copy everything to the SemiDisk board, but conserving space on this electronic disk will allow you to make use of several pre-defined user areas in your workspace as discussed later on.

After the copying process is completed, back out of the Copydisk program and press the Menu key. Insert the Load Disk in Drive A and select <S>etup. Under <V>aldocs System Characteristics, choose drive M for both the System Disk and Data

Disk options. A brief message, "Checking M Drive," will appear. Also choose 0 for both the System User and Data User options.

Make sure that the Indexer, Editor and Spreadsheet overlay options are all set to <S>ystem Disk. This is where many people have gone wrong. Drive M is your system disk now, not simply a memory disk.

Finally, choose your experience level and startup program as you wish. I recommend <E>xpert so you can utilize TPM programs, and <A> Editor, which allows you to make interesting use of the Control-V windows.

After completing the setup procedure, exit to the Editor and enter a Control-M, <C>hange Data Disk, and reboot the system. Place your load disk in Drive A; Drive B can be empty. After initialization, the System Disk will be Drive M and you'll be ready to go.

You will have to keep your load disk in Drive A in order to provide the system tracks to Valdocs. There are no tracks 0 and 1 on the SemiDisk. Occasionally, when changing modules, for example, you'll see Valdocs refer to the TPM tracks on Drive A as the drive's light glows briefly.

Some people choose to make their Data Drive/User Area "M1." I don't, because I keep my calendar on the system side of things. On the other side, I have set up three user areas. Area 1 is set aside for articles published in my newsletter, the Central Maine Epson User's Group (CMEUG); Area 2 is set aside for personal correspondence; Area 3 is set aside for business-related documentation.

I have created four user-defined keystroke macros to allow me to move from one user area to another. Grouping files in such a manner will make it easier to back them up since unrelated files are in separate areas. Backups will consist of similar data and files, and can be backed up all at once to avoid a "pick and choose" session. If necessary, a backup file can be retrieved if it has been grouped with similar files or in some other logical manner.

A word of caution about back ups: Be aware of the collective size of all the files you are backing up. Your disk might not be able to hold everything you have in any given user area. While you can tag several files to copy in the Valdocs Copydisk utility, it does not give you a tagged files size. You must track this yourself and make sure it does not exceed the capacity of your disk.

As one becomes more and more expert within the Valdocs environment, the help files need no longer remain on the SemiDisk. Taking them off of MO frees up an additional 228K of space.

Even more space can be gained by removing unneeded printer files. For example, if you do not have an Epson LQ-1500 printer attached to your system, there is no need to have LQ1500.STL or LQSIDE.STL files on Drive MO. Removing them will add another 17.5K. If you do not use the Mail program or the Scheduler, additional space can be freed up there.

Your goal in removing unneeded files should be to approach an amount of free space totaling or exceeding the number of pre-defined user areas you wish to set up times the storage capacity of a QX-10 disk (376K). So if you have three active user areas to set up, as I do, you should try to keep about 1.1 megagytes (1,100K) free to serve as your working space.

There is, fortunately, a happy middle ground between having files online on Drive M and offline on a stored floppy. This middle ground is the load disk in Drive A. After you've configured your system for the SemiDisk, only five files are required to be present on the load disk in order for Valdocs to switch over to Drive M successfully. These files are INDX.CHN, INITIAL.INI, LOADUP.CHN, RESTART.LSYS and SYSINIT.CHN. With only these files present on your load disk, some 300K of space is available for occasional use. Be sure to make a copy of your load disk before deleting any files.

In addition, you could place the help files on the load disk; then if you occasionally need to use them they will already be in Drive A. When you press the Help key, Valdocs checks the system disk (Drive MO) and doesn't find the help file. It prompts you to place the appropriate disk in Drive A and press any key. Since HELPO.HLP and HELP3.HLP are already in Drive A, you simply press any key and you're there. This double-key approach can be taken with any of the Valdocs modules you do not wish to have taking up RAMdisk space but would like to have nearby.

On the other hand, you might wish to place some of the Valdocs utility programs on the load disk — I have LIST.SYS and ZPIP.SYS on it — or perhaps a frequently used CP/M program like PeachCalc or Spelling Proofreader, which can be selected from the <A>pplications Menu or chosen from the TPM prompt.

In all of this, a battery backup unit is essential. Don't get a 2-megabyte SemiDisk without one. The battery backup is for the card, not the computer. It provides current when the QX-10 is turned off, and will provide six hours of backup power in the event your power goes off.

HOW ABOUT CP/M?

The approach I've taken to using my RAMdisk is one of dedicated Valdocs use. I don't plan to use it for CP/M at the moment, since I almost always choose to work from within the integrated Valdocs environment. If you do wish to use the SemiDisk with CP/M your approach could be quite different from mine.

For those interested in using the SemiDisk with CP/M, there are a few things to know. If you buy your RAMdisk from RSI you will not receive any software to allow CP/M to recognize the RAMdisk — such software is built into Valdocs. You will instead have to purchase the necessary software from SemiDisk Technologies, for about $30.

Be aware that many users caution against trying to run both Valdocs and CP/M on the SemiDisk board. To me it doesn't matter, as my serious work is done exclusively with Valdocs. If you use the board with CP/M, make sure your Setup for Valdocs indicates Drive A as the system drive and Drive B as the data drive. And check with RSI once in awhile to find out what new RAMdisk information might be available about enabling both operating systems to share the board.

Also remember that Valdocs has many different implementations. There are differences in the way Valdocs 2 and Valdocs+ store setup information on the system tracks (0 and 1), for example.

Valdocs+ II is a whole new system with a 2-megabyte RAMdisk. It's quiet, it's faster, and it requires almost no disk swapping. Whether or not you opt for a RAMdisk or a hard disk depends on the use to which your computer is put. But for my applications, it's a winner. •

ASTROKEY

This keyboard enhancer is fast, fast, fast. If you don't need on-the-fly capability, it's worth looking at.

By John D. Yoder

Key enhancement programs come in two flavors: One type works by intercepting keystrokes from the keyboard and translating them into another character, while the other modifies the key definition tables on the system tracks or memory banks. SmartKey is an example of the former. In the latter category are CP/M 2.25's PFK, Valdocs 2's DEF and Astrokey, a CP/M program developed by Astro Research in Corvallis, Oregon.

In practice, both types of enhancers make keyboards much faster to use by standardizing keystrokes and making repetitious keystrokes into key strings, but there are important differences in how they operate.

After some initial frustration with Astrokey, I learned to appreciate its very real strengths. Although it cannot redefine the keyboard "on the fly," Astrokey is extremely fast, easy to edit, and it does not take up space in memory like the RAM-resident, on-the-fly keyboard customizers.

A SLOW START

The two hurdles I had to overcome when starting to work with AstroKey were some gaps in the documentation and a preference for RAM-resident keyboard enhancement programs. I began testing Astrokey with a non-HASCI version of WordStar. After placing Astrokey and WordStar onto a disk with CP/M 2.25, I loaded Astrokey. (Note: Astrokey will not work with CP/M versions prior to 2.20.)

Problems with the documentation began immediately. The main menu presented a series of choices. It told how to move "key assignment tables" and "function key strings" to and from system tracks and how to edit tables, system tables and disk files; there was no indication of which choice should be made first. Since I didn't know which of these actions I wanted to perform, it was back to the manual for help.

The manual, although sketchy at this point, told how to get into the table for editing programmable function key strings. Once there, the process of entering key strings was a breeze.

BREEZING THROUGH

The initial editing table consists of two lists of the 18 HASCI-2 keyboard function keys. Since the right list does not contain the HELP key, there are a total of 35 possible keys to which you can assign the strings.

As the table is set up, the left column redefines the function keys in the unshifted or normal mode and the right column has the same keys in the shifted mode. But you don't need to accept those 35 keys for redefinition. Any key on the keyboard can be assigned to those 35 slots or the same key to several slots simply by pressing "A" and then the key you want to redefine.

Astrokey permits the same key to be redefined several ways by using the control, shift and graphic shift keys or a combination of these shift keys. For example, in WordStar there are three ways to save a file. I assigned all three ways to the QX-10's STORE key by using different shift combinations, and put the STORE key in three different slots in the editing table. My assignments were as follows.

STORE =
^KS^QP (save and resume)

Shift and STORE =
^KD (save, done)

Graphic shift and STORE =
^KX (save and exit)

I could have assigned those three ways of storing a file to the STORE, PRINT and SCHED keys, but remembering which key performed what function would not have been as easy as having all of them related by name to the function I wanted to perform, namely saving a file.

More of the strengths of Astrokey became apparent as I worked with the editing tables. Entering and editing key strings or assigning keys to the editing table for redefinition was a snap. I could change my mind about what to enter a dozen times or correct my mistakes without any problem. Of course, I didn't know if the strings were accurate until I executed them in WordStar — this is a major disadvantage of a table-based redefinition program.

It was also easy to enter returns and control characters in the middle of strings. For returns, you just press the ENTER key on the numeric keypad, not RETURN. Control characters were dim, so you know when you have them entered correctly.

I also came to appreciate the advantage of having all the redefinitions in front of me in a table as I entered new ones, a feature that isn't present in SmartKey, for example, until you save your new definitions.

After redefining several individual keys in the key assignment table, I found myself back at the main menu. Now what was I supposed to do? I knew I wanted to save my redefinitions, but the menu did not say whether I created that file before or after moving the strings to the system table and system tracks.

Rather than lose my new key strings with the wrong choice, I decided to call Astro Research. Harry Demarest, Astrokey's author, answered the phone on the first ring. He explained the proper procedure for storing the key strings: First, move the strings from the edit table to the system table and then from the system table to the system tracks. This operation is completed in two seconds with two keystrokes. He also told me that subsequent shipments of Astrokey would have a tutorial that would help users negotiate such trouble spots.

With that help, I stepped easily through the procedure for patching my redefinition table onto the WS.COM file so that it would automatically load when I ran WordStar. In the process I decided this particular series of keystrokes was a good candidate for redefinition as a key string if I wanted to add new strings later. After entering those new redefinitions into the editing table and patching the file to WordStar again, I was ready to test my key strings.

I'm happy to report that they worked beautifully and fast. (With keyboard customizing utilities, fast *is* beautiful.) I had reconfigured WordStar to work like the Valdocs editor with which I'm more familiar.

Later tests of Astrokey with PeachCalc and Peachtext were also successful. I was particularly pleased by this since I have never been able to make SmartKey work with either program.

LIMITATIONS

What then are the strengths and weaknesses of Astrokey? First, let's look at the limitations.

1. As I mentioned right off, you cannot create key strings or reassign individual keys on-the-fly with Astrokey. You must exit from the program you are running, redefine keys, then go back to the program to see if you have entered the strings correctly.

In practice this limitation was not as great as I thought it would be. Once I had created key strings for exiting and entering Astrokey, the process was relatively fast. And after I had my basic redefinitions set up, I didn't add new ones very often. Still, I like to execute my key strings as soon as I make them. The possibility of making a mistake entering one is fairly high.

2. Astrokey can enter no more than 24 characters in a key string. This number is quite adequate for whipping through most menu-driven programs or for short commands, but it isn't enough characters for serious text entry. Even a simple inside address like:

John Doe
815 Green St.
New York, NY 10001

is 41 keystrokes long, counting returns. On-the-fly customizing programs can insert thousands of characters at a time.

3. Astrokey's documentation has gaps. I've mentioned this problem already. I hope the promised tutorial clarifies the procedure for moving files to the right places.

4. Astrokey's redefinitions may interfere with some HASCI programs. Trial and error should help you avoid the keys that a particular program wants to use for its own functions.

STRENGTHS

Turning our attention to the good points of Astrokey finds:

1. Speed: Astrokey executes key strings almost instantaneously.

2. BIOS based: Unlike SmartKey and XtraKey, this program does not take up space in the transient program area of RAM. Rather, it modifies existing key definition tables. Consequently, it does not interfere with basic input-output calls as is sometimes the case with RAM-based customizing programs. And since it does not take up space in RAM it will work better with programs that require a lot of RAM, like Multiplan and Turbo Pascal.

3. Versatility: Astrokey redefines keys, not characters. The reverse is true of RAM-based customizers. The significance of that difference is that Astrokey permits you to redefine the numeric keypad without affecting the top line of numeric keys.

4. PFK files: Astrokey can read a PFK file created through CP/M 2.25 into its edit table. That can save re-keying a series of redefinitions. PFK will not read most Astrokey files, though, since the program has more options than PFK can handle.

5. Support: A software producer who answers his own phone is a rare blessing. Astro Software obviously cares about satisfied customers.

6. Number of keys to redefine: Including shifts, Astrokey can redefine 635 keys — 100 keys with six shift combinations plus 35 function keys. That's heavy-duty customizing, but you'd need a template the size of your wall to remember them.

7. Custom files: Astrokey comes with several redefinition files ready to load. Included are files for non-HASCI dBase II, Turbo Pascal and a Dvorak keyboard.

If you need a key customizing program for inserting paragraphs into form letters and on-the-fly capabilities, get SmartKey or XtraKey. But if you don't care about on-the-fly customizing and want to enter individual keys, short keystrings and brief text, Astrokey is the fastest program in town.●

BASICALLY BETTER

Microsoft isn't the only game in town.

By Alan L. Zeichick

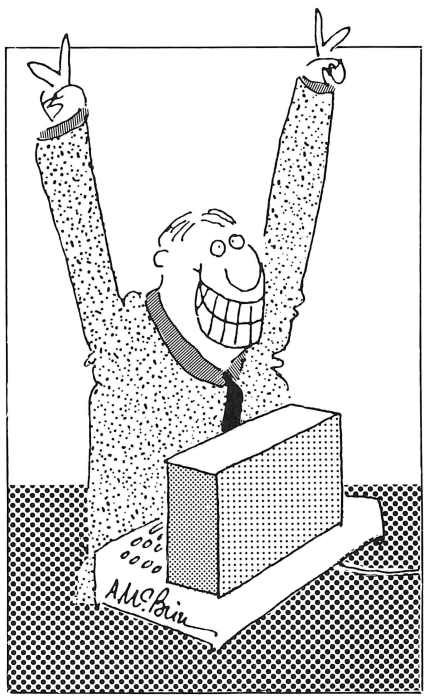
Better BASIC is one of several new versions of that venerable programming language introduced in the past few years. This version offers features rarely associated with BASIC — usually found only on more modern languages such as C and Pascal. But unlike those languages, Better BASIC is similar to GW-BASIC, and thus easy to adjust to. It's also efficient — three to four times faster than GW-BASIC.

ADVANCED DATA TYPES

Standard GW-BASIC has only a few data types: strings, integers and single- and double-precision real numbers. This set is fine for many operations, yet fails to take full advantage of a microcomputer's abilities.

Better BASIC provides the following data types:

- Byte — Byte variables may have values between zero and 255. Bytes consume less space than integers and are faster to process. They're often useful as status flags, counters, and in very large arrays.
- Integer — Integers here, as in GW-BASIC, may have values between -32768 and +32767.
- Real — Real numbers are defined with predetermined accuracy between six and 24 digits. GW-BASIC's double-precision mode offers 17 digits of accuracy. Better BASIC stores real values in Binary Coded Decimal (BCD) format instead of hexadecimal, which GW-BASIC uses. Thus, values such as 1.01 are represented exactly, not by a hex approximation.
- Pointer — Pointers are variables that hold memory addresses, such as those returned by GW-BASIC's VARPTR function. Variables defined as pointers may be SET to any other variables — or part of a string or



array. The pointer is then considered equivalent to that variable or string section or array element.

- String — String variables may vary in length from one to 32,767 characters. Unlike GW-BASIC, the length of each string must be predetermined, with a default length of 16 characters.

Beyond data types are data structures. GW-BASIC supports only one: the array. Better BASIC adds the record, which can be thought of as an array with each element (called a Field) representing a different data type. A sample personnel record might read:

```
STRUCTURE: Employee
INTEGER:
Age,Height,Weight,Number
REAL: Salary,SocSecNo
STRING:
FirstName,LastName,MidInitial
END STRUCTURE
```

If several variables are defined as data type EMPLOYEE, they can be compared for equivalence and assigned values, and then be broken down by individual fields.

Reflecting the idea that variable declarations are non-executable, Better BASIC has eliminated the usual DEFSNG and DIM statements. Variables, arrays and records are defined in unnumbered lines at the beginning of a program. Unfortunately, the language's editor doesn't provide an easy way of removing or modifying a variable's attributes. To change those lines, a separate editor such as Edlin or WordStar in non-document mode must be used.

STRUCTURED PROGRAMMING

The expression "structured programming" indicates that programs flow smoothly, from top to bottom, without GOTO statements. Early versions of BASIC were unable to be fully structured. Because the language lacked a variety of iterative and comparative constructs, the GOTO was a necessity. That's one reason why BASIC is frowned upon in academia.

GW-BASIC improved on the original BASICs with its WHILE/WEND block and one-line IF-THEN-ELSE. Better BASIC advances the cause of structured programming even further with other loop constructs.

In addition to the FOR/NEXT structure, blocks may be started with several conditional statements:

- DO (unconditional).
- DO x TIMES (straight count without using a variable).
- DO IF logical expression (multiple line IF-THEN block).
- DO UNTIL logical expression (iterative block that is always executed at least once).

• WHILE logical expression DO (iterative block that may never execute).

These logical constructs may be ended with any of the following:

• END DO (unconditionally terminates execution of any DO or WHILE block).

• REPEAT (repeats execution of an iterative block).

• REPEAT IF logical expression (repeats execution of an iterative block unless condition is false).

• The EXIT statement branches from within an iterative or conditional block to the statement following the block. GOTOs that would branch into or out from a block aren't allowed.

Better BASIC rewards programmers who choose these structures over the GOTO statement: When listed, program lines within an iterative or conditional block are automatically indented.

If the programmer really wants to use the GOTO, Better BASIC doesn't complain. But it's wiser and more efficient to use the structured programming utilities.

SOFTWARE LIBRARIES

One of BASIC's handiest features is the subprogram, embodied in the GW-BASIC GOSUB and DEF FN statements. GW-BASIC's subprograms, however, have built-in limitations:

• Functions defined with DEF FN may be only one line long.

• Errors in programming can result in GOSUBs to incorrect locations or GOTO branches in or out of a subroutine.

• Variables used in a subroutine are all global. They're always the same as those in the main program. Unintentional duplication of variable names may take place with undesirable results.

Better BASIC has the same GOSUB/RETURN structure as GW-BASIC. But it also offers another construct, called the procedure — very similar to those in the Pascal language.

Procedures are complete subprograms that exist independently of the main program, but which can be called from the main program to do some specified action. Defining a procedure is almost like defining a new Better BASIC primitive statement. Each procedure has its own set of line numbers and local variables, which may be of any of the above data types or data structures.

Variables in procedures may be local or defined as ARGuments; these are passed to and from the main program. Another variable type is EXTERNAL. External variables are accessible by the main routine and by all procedures.

Better BASIC uses these procedures to add groups of language functions. Most input/output (I/O) statements, including graphics and interrupt handling, are procedures.

Better BASIC functions execute like GW-BASIC's functions. These, however, are also separate subprograms, and may be as complex as desired. For example:

> Better BASIC has eliminated the usual DEFSNG and DIM statements.

```
REAL FUNCTION: DOUBLE
REAL ARG: VALUE
10 RESULT=VALUE*2
END FUNCTION
```

In the main program, a statement

```
PRINT DOUBLE(1.23)
```

will print 2.46, and

```
LET A = DOUBLE(DOUBLE(1.23))
```

assigns the value 4.92 to A.

IT EVEN DOES WINDOWS

Better BASIC offers a variety of predefined procedures that simplify the use of pop-up windows:

• DEFINE WINDOW sets the size, location, and color attributes of a screen window.

• FRAME WINDOW determines whether a border should surround the window.

• HEADER places a title at the top of a user-defined pop-up window.

• SAVE SCREEN and RESTORE SCREEN store and recover screen information into a character array. With these commands, the characters or graphics underneath a pop-up window can be preserved.

• SELECT determines which pop-up window, or the main screen, is the current working window.

• WINDOW activates, deactivates and controls scrolling within windows.

Better BASIC offers a vast library of special functions and statements. It's a long list, as the language has 267 keywords. Space doesn't permit a description of all these functions, but some examples include: a built-in variable cross-reference table generator, advanced interrupt handling and many screen-graphics commands.

Better BASIC's documentation is long — 691 pages plus a good index — and comprehensive. However, it's written as a language reference manual, not a friendly tutorial on how to best use Better BASIC's advanced features. It assumes, without saying so, a solid programming background.

An example is XMEM, or Extended Memory. This feature is mentioned several times in the manual, but it's explained best in the INTEGER ARRAY section: "If any name is followed by the switch '/X', then that array will be located in the Extended Memory Space." Evidently, XMEM is space that can be used for variables, but not addressed directly by the program.

One appendix gives hints for converting Microsoft BASIC programs to run on Better BASIC. It's a good idea to edit an ASCII version of the GW-BASIC program, placing LET before all assignment statements, deciding on variable attributes, and separating multi-line statements for ease of debugging.

Most GW-BASIC programs should run under Better BASIC — but be prepared to spend hours mastering Better BASIC and debugging the software.

Is Better BASIC worth the expense and the time required to port existing software? Yes — if there's a real need for high-performance in-house programming. Better BASIC is a bigger BASIC than Microsoft's. But it's only worth acquiring if GW-BASIC seems to be a tight fit.•

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BOOLEAN REALITY

The third in a series about Boolean logic.

By Jim Hansen

Digital computers are built up from only three basic building blocks, called gates, which function electronically the same as the Boolean functions *and, or* and *inverter* or *not.* From these functions logic (or schematic) diagrams can be drawn and truth tables for the various gates derived.

THE BUFFER AMPLIFIER

Let us consider for a moment a simple electrical current consisting of a battery, a switch and a lamp, as shown in Figure 1. If the switch is open, no current will flow and the lamp will be off. If the switch is closed, current flows, heating the filament in the lamp, causing it to glow.

We can set up a simple truth table to map out the relationship of the switch and the condition of the lamp in a logical manner. If the switch is open, the lamp is off; is closed, the lamp is on. This table is shown in Figure 2.

Binary numbering is a convenient method to indicate switch states. The logical symbol *0* can be used to mean the open position, indicating the lamp is off. The symbol *1* can be used to indicate the closed position, showing that the lamp is lit.

This circuit can be described using Boolean functions: A switch, which has only two possible conditions, either 1 or 0, and a lamp with the same options. If the switch is in the logical state 0, the lamp is also in a logical 0; if the switch is set to a logical 1, the lamp is also a logical 1. This relationship is shown in Figure 3, a truth table representing the same functional characteristics in Figure 2, but this time using logical equivalents.

The digital equivalent of this circuit is called the buffer amplifier, or more commonly, a buffer. It has no logical

Text continues on page 36

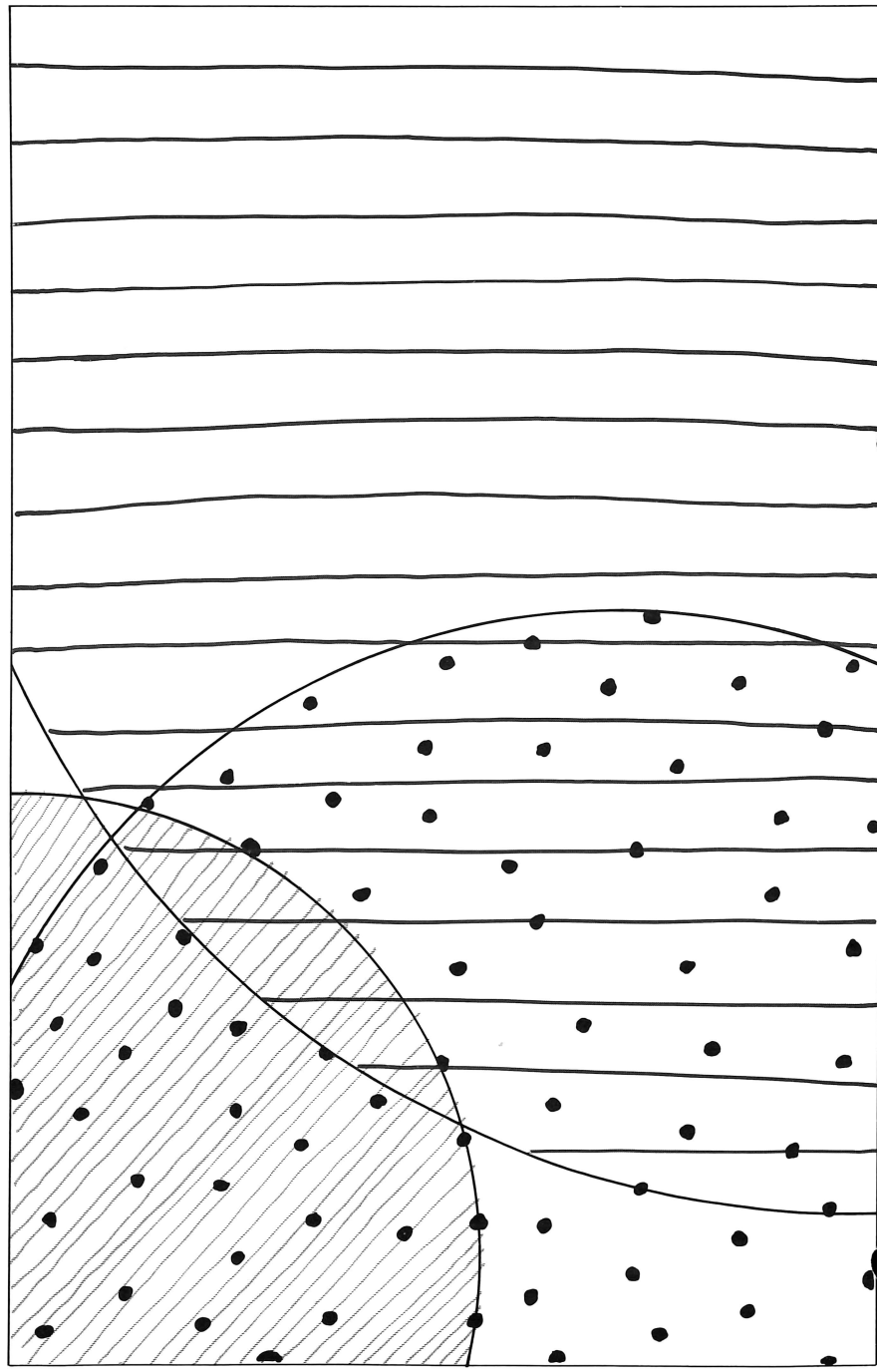


ILLUSTRATION BY ELIZABETH MARITATO

Figure 1. Simple lamp-switch circuit.

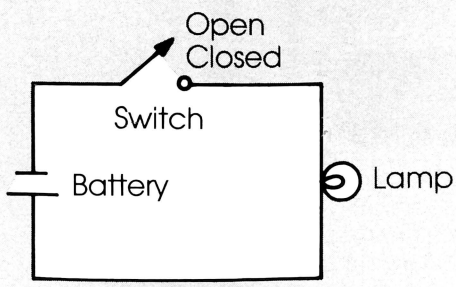


Figure 2. Truth table for Figure 1.

Switch	Lamp
Open	Off
Closed	On

Figure 3. Logical equivalent of Figure 2.

Switch	Lamp
0	0
1	1

Figure 4.

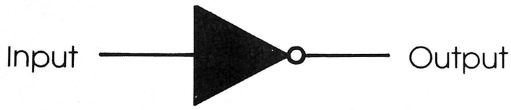
Buffer Amplifier Logic Diagram.

Buffer Amplifier Truth Table.

Input	Output
0	0
1	1

Figure 5.

Logic Symbol for Inverter.

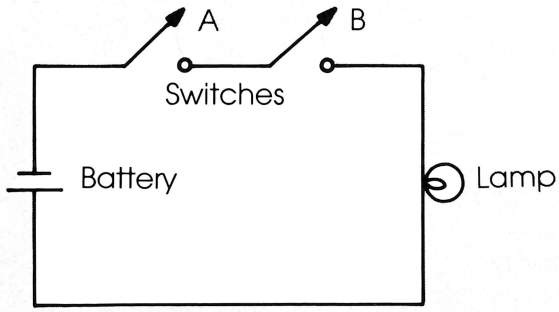


Truth Table for Inverter.

Input	Output
0	1
1	0

Figure 6.

And *Circuit.*



And *Circuit Truth Table.*

Switch		Lamp
A	B	
Closed	Closed	On
Open	Closed	Off
Closed	Open	Off
Open	Open	Off

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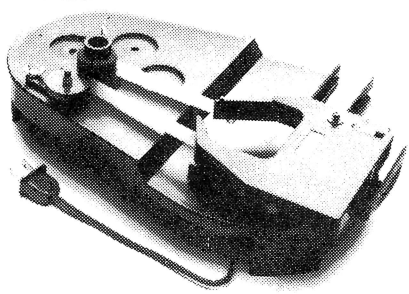

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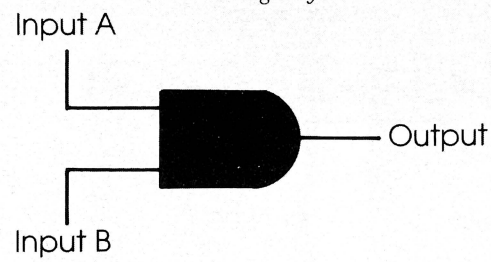
Figure 7.

And *Gate Logic Symbol.*

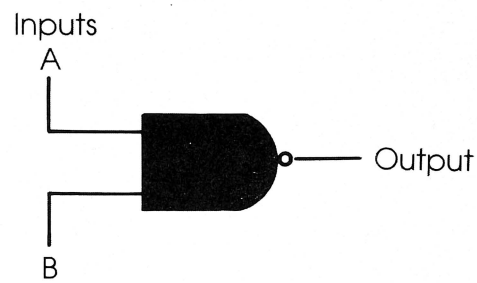


And *Function Truth Table.*

Input A	Input B	Output
0	0	0
1	0	0
0	1	0
1	1	1

Figure 8.

Nand *Circuit.*



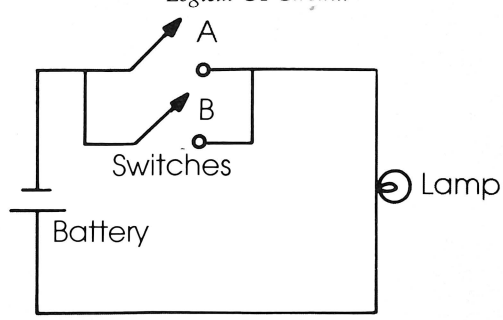
Nand. *Truth Table.*

Input A	Input B	Out
0	0	1
1	0	1
0	1	1
1	1	0

Input B \ Input A	1	0
1	0	1
0	1	1

Figure 9.

Logical Or *Circuit.*

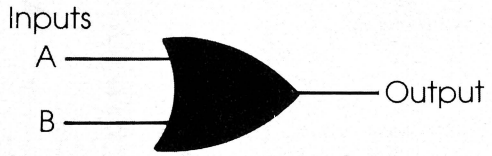


Or *Truth Table.*

Switch A	Switch B	Lamp
Open	Open	Off
Closed	Open	On
Open	Closed	On
Closed	Closed	On

Figure 10.

Logic symbol for Or *Gate.*

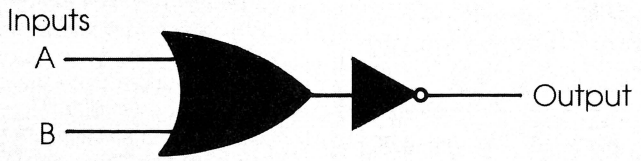


Or *Truth Table.*

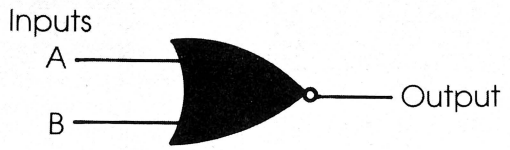
Input A	Input B	Out
0	0	0
1	0	1
0	1	1
1	1	1

Figure 11.

Nor *with External Inverter.*



The Logical Nor.



Logical Nor *Truth Table.*

A	B	Out
0	0	1
1	0	0
0	1	0
1	1	0

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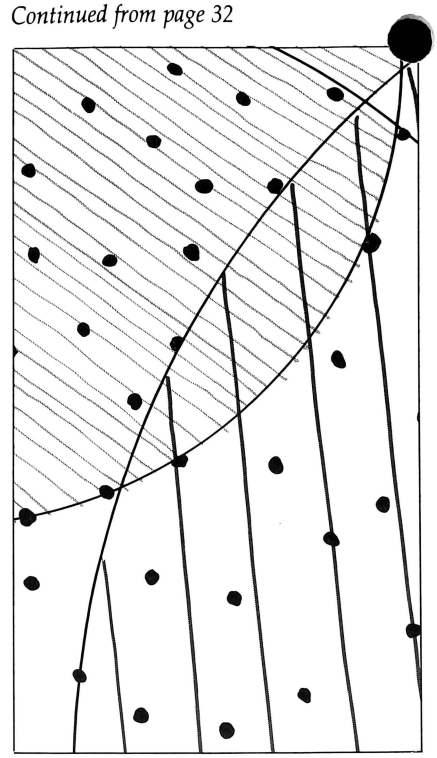

significance; that is, whatever input goes to this gate is output without change, but electrically it is used to amplify a signal that must be sent to many gates, or to change voltage levels. This is necessary when lights, relays or motors are to be driven from a digital signal. Gates are not generally "strong" enough to drive anything except more gates.

The logical symbol for a buffer amplifier is shown in Figure 4. The input to a buffer is always shown going into the square end; the output is always taken from the pointed end. Figure 5 shows an inverter. This is the same symbol as the buffer, except a little circle or "doughnut" is drawn on the pointed end, indicating that the output is the complement of the result of the buffer.

THE *AND* GATE

By going back to the original lamp and switch circuit and adding a second switch in series with the first, an *and* gate is established, because switch A *and* switch B must be closed before the lamp will light. The diagram of the modified circuit and the switch truth table is shown in Figure 6.

The logical symbol and truth table for the *and* gate is shown in Figure 7. Notice that the output will always be off (a logical 0) if either of the two inputs are off, or logical 0. The output of an *and* gate will be 1 only when

both inputs are a logical 1. In practice, [illegible] gates can be purchased with as many as 13 inputs; however, those with only two are used much more often.

Figure 8 shows the effect of inverting the output of an *and* gate. This can be done by connecting the output of an *and* gate to an inverter or by using a *not-and,* or *nand* gate logic chip. The *nand* gate is a very commonly used part, more so than the standard *and.*

Figure 8 also introduces a second form of truth table. This time the resulting output is placed in the box of the intersection of the possible inputs. Input A (shown across the top) can have either a 1 or 0 state; input B (shown on the left of the table) also has a 1 or 0 state. Going across, if B is a 1, the output will be a 0 if A is a 1, and a 1 if A is a 0. This table format is useful when there are only two inputs, but should be used for reference only.

The lamp and switch circuit can be used one more time to demonstrate the logical *or* function. By hooking up two switches across each other, as shown in Figure 9, the lamp will light [illegible]enever either Switch A *or* Switch B [illegible]losed. The logical symbol for the *or* gate is shown in Figure 10.

The *not-or,* or *nor* gate, is shown in Figure 11. Like the *nand,* the *nor* function is made by simply inverting the output of an *or* gate; and like the *nand* gate, the *nor* gate is more common than the straight logic *or.* The truth table also shows that the output is simply the complement of the *or.*

THE RW

These gates work exactly the way Boolean identities say they should. It is important to realize that given the simple *and* and *inverter,* any other gate can be constructed. This is one of the interesting features of logic design.

Even the most powerful of computers in the real world start with gates no more powerful nor sophisticated than the ones just described. Advances in integrated circuit design have not been the discovery of new gates so much as the miniaturization of the basic gates. The Intel 80286 microprocessor, for example, has the equivalent of tens of thousands of gates on a chip of silicon [illegible]ut a third of an inch square. •

The saga continues. Next month, Mr. Hansen will describe how to build a logic test bed.

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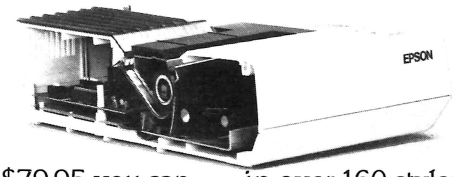

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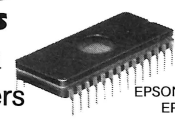

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Monitoring of environmental parameters by laptop computers has become affordable to the hobbyist by the availability of moderately priced analog-to-digital peripherals. To some people, $500 for a 16-channel, 12-bit accuracy data acquisition peripheral seems like a steal. But I only needed one channel and not quite 1 percent accuracy, and was really thinking of a cost of more like $10!

The application I had in mind involved taking air flow measurements directly from a vane anemometer. The computer can be any system equipped with an RS-232 serial port and BASIC.

Used to measure air flow velocities in chemistry lab fume hoods, this instrument has no electrical output. I intended using a photoemitter/detector combination to provide the necessary transduction. Electrical pulses from this combination would be sent via the RS-232 port to the computer, where the serial input would be converted into air flow measurements. That was the idea.

It turns out that it worked, but not without a few discoveries along the way. As the vanes of the anemometer interrupt the emission path to the photodetector, an on-off pulse is generated. The pulses are detected at pin 3 of the RS-232 port and are counted as discussed below. By calibrating the raw data against readouts from the anemometer dial, the pulse rate is converted directly to air flow rate.

Figure 1 shows the pin connections made between a DB-25 connector and the photoemitter/detector interface. I used an infrared emitter and detector pair available from Radio Shack (catalog number 276-142). Other makes would work as well. Input to the computer from the photodetector is via the RS-232 port at pins 3 and 20.

```
10 ' ****************************
20 ' *      RELTYM 2.5          *
30 ' * (c) K.E. OSBORN 11/18/85 *
40 ' ****************************
45 '
50 ' MONITORS PULSED INPUT OF 1-400
60 ' HZ ON RS232 VIA IR PHOTODETECTOR
70 ' CONNECTED TO PINS 20(+5v) & 3
80 ' (RECEIVE). IR EMITTER CONNECTED
90 ' TO PINS 7 (GND) AND 20.
100 '
110 '     INITIALIZATION
120 '
130 CLS:CLEAR 500:MAXFILES =2
135 ON ERROR GOTO 6000
140 DEFINT A-Z
150 CLOSE:OPEN "RAM:HOOD" FOR APPEND AS 1:OPEN "COM:97I1D"
    FORINPUTAS2
200 '
210 '     HOOD SETTINGS/TITLE LINE
220 '
230 CALL 17001:PRINT @ 10, " RS-232 MONITOR ":CALL 17006
240 PRINT @ 100,"";
250 INPUT "ENTER HOOD # ";HN
260 PRINT @ 140,"";
270 INPUT "POSITION   # ";PN
280 PRINT @100, SPC(12)
290 PRINT @140, SPC(12)
300 '
310 '     SCREEN LAYOUT
320 '
330 PRINT @87,  "      COUNT = ";
340 PRINT @ 171,"RATE =      fpm";
350 PRINT @290, "TIME = ";
1000 '
1010 '    SUM PULSES/KEEP TIME
1020'
1030 CALL 6560:TI=EEKI(63779): 'INITIALIZE TIME
1040 TS=(TI+9)MOD10: 'STOP TIME
1050 CALL 6560:IF TI=PEEK(63779) THEN 1050: ' WAIT FOR CLOCK CHANGE
1060 PRINT @ 2,"M";:POKE 65414,0
1070 C1=PEEK(65414):N=N+1
1080 IF C1>60 THEN C2=C2+1:POKE         65414,0:C1=0
1090 C3=C1+C2*60
1100 PRINT @102,  C3;
1110 CALL 6560:IF PEEK(63779) THEN 1050: ' WAIT FOR CLOCK CHANGE
2000 '    CALC FLOW/RESET COUNTERS
2010 '
2020 POKE 65414,0:C2=0:PRINT @2,SPC(3);
2030 R! = 1.23*C3
2040 PRINT @178, USING "####";INT(R!)
2050 PRINT @300,TIME$;
2060 FOR WT = 1 TO 200:PRINT @285, "OK?;NEXT
2070 PRINT @285,SPC(3)
2080 IF PEEK (65450)>0 THEN PRINT #1,SPC(3); HN;SPC(10);PN;SPC(10);R:
     POKE 65450,0:GOTO 130
5700 GOTO 1030
6000 RESUME 100
```

Pin 20 provides a +5-volt output — the signal is activated when a COM file is opened. (Pin 20 is referred to as the data terminal ready pin.) The photoemitter is connected between pins 20 and 7 (ground). A 200-ohm resistor between pin 20 and the photoemitter protects the LED.

The interface is positioned with the LEDs on opposite sides of the

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YOU BE THE EDITOR

Every reader has unique needs. Some seek guidance from reviews of software and peripherals. Others look to a magazine to provide tips to increase their programming proficiency. Accounts of innovative applications attract a big audience, as do articles about other users who find creative ways to use their systems.

You can help tailor **EPSON World** to your unique needs by rating the articles that appeared in this issue. Just circle the numbers indicated below on the Reader Service Card at left. Rate all the articles, some of them or just one. Then detach the card and drop it into the mail — we pay the postage.

The editors will analyze your feedback and respond by commissioning more articles of the most popular types — and fewer of the losers.

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anemometer so that the vanes can pass between them. As the vanes interrupt the light path, the resistance of the photodetector swings from low to high. At each interruption, pin 3 receives a pulse with a peak at about +5 volts.

The serial communications port transmits bytes to a data buffer at addresses 65350d through 65413d. Addresses 65414d, 65415d and 65416d are designated as pointers for the buffer. The pointer at address 65414d is incremented each time a pulse is received at pin 3. This fact is the basis for the accompanying program.

The program converts input at pin 3 to air velocity measurements. Lines 130-150 initialize variables and open a COM file for input. The number of the fume hood and location within the hood are entered in lines 250 and 270. The screen layout in lines 300-350 prints the data variable names. Lines 1030-1100 set up a continuous loop that counts the number of pulses.

The pulse counting loop starts by reading the system time with a call to 6560d. The initial time is set to the current second. The stop time is then calculated and the program waits at line 1050 until the clock advances. An "M" is displayed to indicate measurement has started and the buffer pointer is zeroed in line 1050. Lines 1070-1090 accumulate the counts in the point, which is arbitrarily reset at a count of 60. The count is printed on each pass through the loop in line 1100. At line 1110 the time is compared to the stop time. If unequal, the program branches to line 1030 to make another reading.

If the system time equals the stop time, the program branches to the start of the calculation routine at line 2050. The rate is calculated from the accumulated number of pulses, the elapsed time and the anemometer calibration factor. The calibration factor is determined by running a linear regression on a series of readings. The screen display pauses for about a second. If the reading is acceptable, pressing any key will place the reading into the data file. If not, the program will start another count.

I have used this interface and the program to evaluate fume hoods in a chemistry laboratory. With only limited modifications, frequency measurements of almost any oscillating mechanical system could be made.

If you have any questions send me a SASE together with your comments and queries. Ken Osborn, 1496 Palm Ave., Richmond, CA 94805.

Computer Camera

Photographing a live computer monitor is not an easy task. In the May issue of Epson World, Jim Hansen presented his tips on the subject, starting on page 11. This month, it's Joanne Metro Rothweiler's turn. — Ed.

With Ricoh's XR-P, a multi-program, 35mm SLR, saving your CAD designs or business graphics on prints or slides need not be difficult. The XR-P's "TV" mode is specifically engineered for reproducing on film the screens of computer monitors and television sets. It can catch the polished look of your computer

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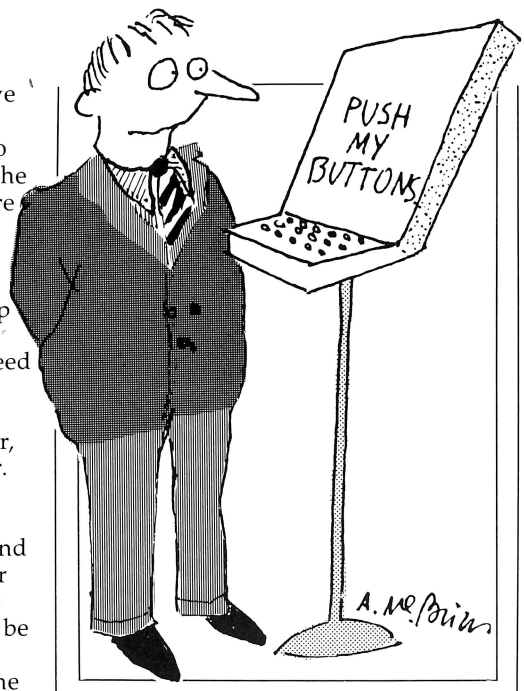

design or graph, and you don't have to be a pro to use the XR-P successfully. While you still have to focus and square off your picture, the camera's computer sets the aperture and shutter speed.

The camera uses special lenses, which bear a "P" setting on their aperture rings. Simply set the f-stop ring on the lens to "P," choose the "PA" mode, and set the shutter speed dial to "TV." The XR-P's 4K ROM chip will do the rest.

Even with the TV mode, however, there are a few points to remember. Use a tripod and cable release to eliminate camera shake during exposure. Make sure the monitor and the camera are not tilted upward or downward, or the resulting picture will be distorted. The camera must be level with the monitor.

Shut off any light in the room. The only light should come from the monitor. In order to photograph only the screen and not the entire monitor and the desk or bookshelf behind it, you'll need a telephoto or macro lens. A wide angle or 50mm lens used close enough to fill the viewfinder will cause barrel distortion.

Richo's Rikenon "P" Macro 105mm 2.8 lens is ideal for computer photography. It focuses continuously from infinity to 13.8 inches, where the reproduction ratio is 1:1, or life size. It features a built-in lens shade and a non-revolving barrel that allows focusing without turning any filters you may be using, and gives a clean, sharp rendition of a computer screen.

Photographing from a television screen with the XR-P is just as simple. The settings are the same except you use the "P" instead of "PA" setting on the camera's mode selector.

The XR-P has a host of other features that you'd expect on a computer-age camera — multiple-exposure lever, auto-exposure memory lock, exposure compensation dial, right- and left-hand shutter releases, intervalometer (used in conjunction with a motor drive, it lets you walk away from the camera while it snaps off pictures at specified intervals), LCD displays, and shutter speeds to 1/2000 of a second. The viewfinder lights up for use in dark or low light conditions.

Included with the camera is a cassette tape of instructions, a user's manual and handy pocket guide.

The price of the Ricoh XR-P (body only) is $365. The Rikenon "P" 105mm/2.8 macro lens is $370.

Circle No. 141

QX-16
795.95 *!

NEW in the box with Valdocs 2, Keyboard, 512 K mem, & 2 Drives. *Monitor not included; new Epson Green monitor only $99.95! The retail price of the QX-16 is $2,495 and your price is far below dealer cost. So don't wait; these will be gone FAST. Yes, we warranty these for 90 days. No, this isn't a misprint, $795.90 IS the system price. QX-16's run QX-10, CP/M, and IBM MS-DOS software. They also have twice the drive storage capacity as a QX-10 (720 K each), 3 QX card slots, serial and parallel ports. QX16HD comes with one floppy and one internal 10 meg Hard Drive from Epson. It uses the same 99.95 monitor the regular QX-16 requires and looks just like the QX-16 pictured above except for a hard drive on the right side. QX16HD retails for $2,995.00. *Buy your QX-16 from an Authorized Epson Computer Store that's been with Epson Computers since they were introduced 3 years ago. Why buy from a Liquidator or any one else that's not a real Computer Store? Where will they be when you need technical answers or warranty work? How comfortable can it be to place your order with an answering service or sending your check to a P.O. Box? If their price happens to be lower than ours, call; we can usually meet the price & surpass the support.*

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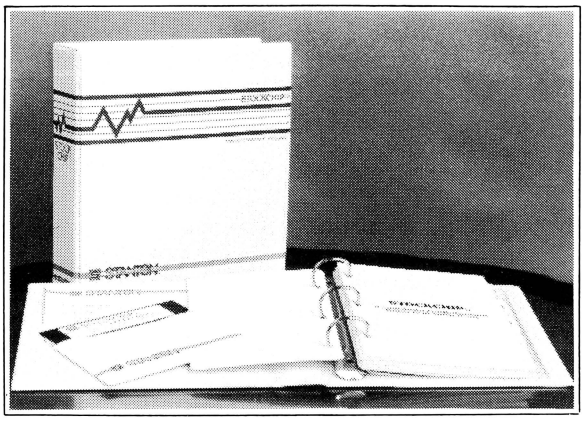

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Circle 27 on Reader Service Card

continued from page 6

as individuals, do not wish to purchase RSI products, that is their prerogative.

They do not, however, speak for me. And I take personal offense at a quasi-independent organization that so wishes to influence other QX-10 owners or dictate consumer policy.

4. Lastly, Mr. Strukhoff also states that "Epson QX owners ... are starting to doubt RSI's ability to get the job done." No one who has used Val+ would have these doubts. Val+ is adequate demonstration of the falsity of such contentions.

To continue is to belabor the issue. Yet be assured that you have secured three results: Epson World has lost a subscriber, Mr. Shoemaker's group has lost a probable member (boycotts work two ways), and Epson America has for current and future products lost a loyal customer.

Donald J. Bennett
Hamtramck, Michigan

More Frustration

After reading the comments about Rising Star in the May issue of Epson World, I find I must speak out. I have experienced inadequate and inexcusable service from Rising Star.

In November of 1985 I ordered Valdocs+ through the National Epson User's Group (NEUG) using a credit card. When the order had not arrived by the end of January 1986, I called Rising Star directly. I was told that Rising Star had no order for me from NEUG. RSI said NEUG had been losing orders and that they would be glad to take a credit card order and forward Valdocs+ immediately with a mouse back ordered. This I did.

I received my January order promptly. Then, two weeks later I received a second order; obviously, the NEUG order. The second order, also without a mouse, I returned with a cover letter through UPS. Now at the end of May I have yet to receive reimbursement of the second order or a mouse.

I was told over the phone around May 1 that a check would be issued in the next 10 days or that we would be called. But I have received no credit slip, check, or mouse. Nor have I received a phone call.

I want Rising Star to succeed. I really like the company's products,

when delivered. However, in good conscience I cannot suggest anyone order from Rising Star at this time.

Peggy L.T. Garrison
Skokie, Illinois

Now Listen Up

I'm sure all Epson/Valdocs lovers are extremely pleased that you've picked up the torch for Epson owners and Valdocs users. We hope you will not forget us. We may be small in number, but the loyalty in our buying power is proven, and cannot be ignored.

My wife and I are completely happy with Valdocs+ and the two computers in our household that use this program exclusively. Moreover, we are, and forever will be, in the market for any program that utilizes the full capabilities of the HASCI/Valdocs system.

We are very *displeased* with two things. One, Epson's total abandonment of the TPM/Valdocs concept, in which we have a considerable investment. And two, your magazine's obvious slant to Epson's new direction. The question: are you going to be just another manufacturer-sponsored computer rag, or will you develop an independent editorial view, including any and all warranted criticism of your namesake?

The reality is that marketing always wins, right? IBM won the war, and Epson surrendered. So what happens to us refugees? Those of us who fought with hard-earned dollars because we believed in a bright new computer philosophy called Valdocs. What we're left with is another casualty, RSI, perhaps fatally crippled by IBM's marketing thugs and the gutless wonders at Epson.

Thank God for Chris Rutkowski. Maybe he'll surface again. When he does, I hope he remembers his devotees — people like my wife and me — who depend and thrive on a human/computer interface called HASCI/Valdocs, which as far as we're concerned has left all the others in the dust.

One more thing. IBM-cloners really have no need for your magazine. Your future subscription base lies in the people who really need you. Take a stand, and we'll stand with you. Surrender to Big Blue, and we're history!

John L. Polk

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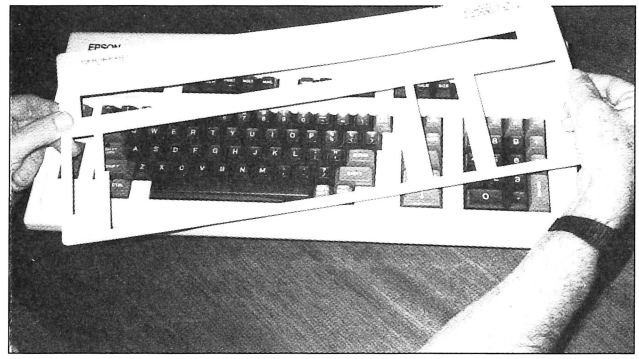

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VDO25.LBR — VDO (Video Display Oriented) Editor is a small (7K) ASCII file full screen editor.
TOUR20.LBR — TOUR is an outline processor much like the commercial programs MaxThink and OutThink. It can help you collect and organize your thoughts.

ESD-24 MS-DOS Miscellaneous

BRADFORD.ARC — Fancy Font type of program that allows near-letter quality printing on Epson, IBM, and Gemini printers in several fonts.
PC-SPELL.ARC — Primative, but effecient.
SPELLER.ARC — Like the above spell checker, it also makes a separate file of misspelled words, instead of marking words in the file itself.
FRED.LBR — A FRee EDitor. Fast but limited.
FC101.LBR — An easy to use spreadsheet that offers a good introduction to spreadsheet concepts.
STARSHIP.ARC — A 'real-time' Star Trek game.

ESD-25 MS-DOS Communications

These programs will run on the Titan board and the Equity, but not the QX-16.
QMODEM20.ARC — Easy to use, but very powerful. It is one of the most popular MS-DOS communications programs.
ULTRA51.LBR — The 'ultimate' war games dialer.

DON'T FORGET THE PX

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Software Critics Agree

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The Critics on SmartKey

- "Excellent..." *InfoWorld*
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- "A must for every computer..." Peter McWilliams, author *The Word Processing Book*
- "SmartKey is a utility I recommend... ...The result is less frustration and greater speed and accuracy in entering data." John D. Yoder, PhD *Reviewer — Epson Connection*
- "...SmartKey is considerably easier to learn ...SmartKey would be my choice..." Bob Hermann *Reviewer — Epson Connection*

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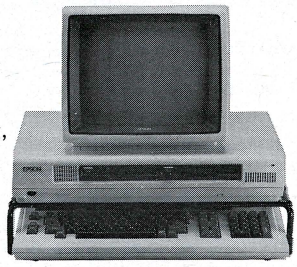
Perfect Epson Stand



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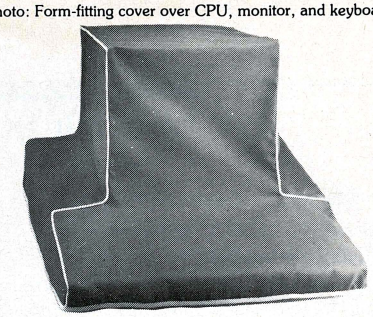

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Actual sample produced by an MX-80 and Fancy Font.

Incredible Printing Machine

Your Epson printer is going to get even better. *Fancy Font* can make it into an incredible printing machine. The *Fancy Font System* is a software program that turns the bits and bytes generated by your computer into over 30 font sets in sizes from 8 to 40 points that can be printed on any Epson MX80 with Graftrax, Epson FX or RX printer, or Gemini 10X printer.

Fancy Font styles include Roman, Bold, Italic, Script, Old English, and more. In addition, custom forms, invoices, labels, signs, foreign languages, mathematical notations, view graphs, resumes, newsletters, brochures, complete manuals, invitations, place cards, and high-resolution, proportionally spaced, letter quality business and personal letters can all be printed on your Epson printer with *Fancy Font* at the helm. *Fancy Font* is a product of SoftCraft Inc. You may have seen SoftCraft's national ads. They are printed with *Fancy Font* on an Epson printer. The ad is powerful visual medicine. The list price for the fully documented *Fancy Font System* is $180. Central's price is only $159. Order *Fancy Font* today and add an amazing sparkle of creativity to all your printed materials. Please indicate name and model of your printer when ordering. *Fancy Font* will make your Epson printer and Valdocs or CP/M word processor come alive. It's magical.

MORE ON NEXT PAGE

Radiation Screen

It's true. Computer terminals shoot dangerous ionizing x-rays at the operator. Exposure to ionizing radiation is cummulative. It doesn't wear off. Bit by bit, it keeps piling on. Too much exposure can lead to radical molecular changes. The kind of changes in the body that express themselves in cancer.

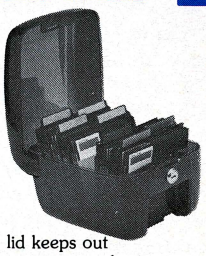
Sure, medical professionals use x-radiation to take pictures of the inside of your body, and to look through your face at your teeth. But, they know the danger of exposure to x-rays. That's why, when they work they stand behind lead impregnated shields. They're smart. They protect themselves.

If you're a computer user, the solution isn't to throw your computer out the window. It's easy to protect yourself against the ionizing x-rays that shoot out at you from your video display terminal. A company called ACCO International makes an excellent combination lead impregnated radiation shield and anti-glare screen that easily attaches to your terminal. It works. In fact, an independent study found that for every 1,000,000 x-rays your video display terminal shoots at you, only 125 will pass through the ACCO Shield. Solid protection.

The ACCO Radiation Shield is just like the ones used in hospitals, nuclear power plants, and at military stations. It's made from a lead impregnated, impact-resistant acrylic. Although the ACCO Shield is 30% lead, you can see through it. The ACCO Shield also doubles as a superior anti-glare screen that reduces glare and other bothersome reflections. The list price of the ACCO Radiation screen is $149. Central's price is $99. Order today. Satisfaction guaranteed. 15 day money back trial. Also comes with a free report that tells how the ACCO Shield stops radiation. Order today.

Attention: Consider that working at a video display terminal is like holding your face about 18 inches from a television screen many hours a day, five days a week. Protection makes sense. Order today.

Lockable Diskette Defender



Handsome, sturdy, smoke-tinted acrylic tray holds 70 Epson-size diskettes. Flip-up lid keeps out dust, debris, and moisture, and locks securely to guard your important work. Comes with 7 dividers with index tabs for easy filing and to keep floppies upright to prevent bending, warping, and scratching. Tough and secure metal lock never comes in contact with diskettes because it is enclosed in a special plastic housing. Super value at $22.95 for one, or $21.00 each if you buy 2 or more. Keep prying eyes and sticky fingers away from your data. Order today.

LQ 1500 Users

Compare and save. Epson's LQ 1500 ribbon gives you 3,000,000 characters. Our top quality LQ 1500 ribbon produces 4,500,000 characters. Epson's list price is $17.50 per ribbon. Our price is $49 for box of six ribbons. In stock. Order today. Complete Satisfaction Guaranteed.

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Product Description		List	Central
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CP/M		$ 39.95	$ 34.00
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Multiplan	**Speeds learning.**	$ 75.00	$ 59.00
SuperCalc	**Gives fast results.**	$ 75.00	$ 59.00
Wordstar		$ 75.00	$ 59.00
BORLAND INTERNATIONAL			
Turbo Pascal 3.0		$ 69.95	$ 58.00
Turbo Toolbox, Software Tools		$ 54.95	$ 47.00
Turbo Tutor, Step by Step		$ 34.95	$ 32.00
Turbo Holiday Pak, All the Above		$129.95	$ 99.95
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FontStar, Print Bright WordStar		$ 49.95	$ 48.00
MICROPRO			
WordStar		$495.00	$219.00
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Screen Smarts, Computer Tamer		$ 15.95	$ 12.95

Prices, specifications, and offers subject to change without notice.

Software to Boost and Keep High Scores

Now you can help your child boost or maintain his grades. It's easy. Resource Software International's educational programs are specially made to help kids get to the top and stay there.

Imagine this. If properly prepared, your boy or girl can be accepted by the college of your choice — no matter how many other students are clamoring for admission. RSI software is created by educators. It lets the child choose the pace of instruction. Challenging computer assisted learning at its best. Available for both CP/M and MSDOS computers. The list price of these programs is $39.95 each. Central's price is only $37 each. They are fun, educational, and easy to use. Order today.

Description	Grade Level	Description	Grade Level
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Simple Addition	1-3	Trigonometry	8-college
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Funzeez	2-5	Basic Inorganic Terminology	8-college
Learning and Using Fractions	5-7	Chemical Symbols	8-college
Learning and Using Decimals	5-7	Inorganic Nomenclature II	8-college
Vocab Building	4-7	Metrics	7-12
Verb I	6-8	High School Entrance Exam	6-8
Letter Writing	6-8	SAT Score Builder	10-12

Text Filing Machine

Now, Epson users can turn their computers into powerful text filing machines. *SuperFile* is a textual matter database manager unlike any other. It puts you in control of your information. It allows you to easily store and retrieve notes, letters, random thoughts, contracts, depositions, invoices, new product information, sales reports, reference articles, scripts, abstracts, bibliographies, customer profiles, photo or slide locations, and much more. *SuperFile* accepts as many as 65,000 entries per database; allows 512,000 keystrokes per record, each of which can have up to 250 keywords; and indexes information you've stored on as many as 255 diskettes per database. Powerful.

Input for a *SuperFile* database comes from your word processing Valdocs, CP/M, or MSDOS program, so you can easily include information you already have into a database without having to re-key it. No fancy fields to define. This is a completely free-form database system. No programming language to learn. There's nothing difficult here. You can be up and running within minutes. *SuperFile* uses logical searching procedures to find your information fast. Tell *SuperFile* what information you want, and it searches from 60 to 400 entries per second. Save yourself the time and effort of filing and cross-filing information by hand or in overly structured data fields. The list price of *SuperFile* is $195. Order today to get *SuperFile* at our current low price of $155.

Full Power Computing

T/Maker Integrated is a highly acclaimed powerhouse program that can turn your CP/M Epson into a computing workhorse. At last, you can enjoy productive computing like never before. Imagine doing full-featured word processing, relational database management, spreadsheet analysis, horizontal bar chart graphics, and checking your spelling all within the same program. No more switching back and forth between barely compatible programs to accomplish these simple tasks. *T/Maker Integrated* is universally acknowledged as a unique integrated software system that is just plain easy to learn. Now, there is an alternative to doing things the hard way. *T/Maker* can put the hidden and largely untapped power of your Epson at your command. *T/Maker Integrated* is regularly $450. Central is proud to offer this outstanding package for the low, low introductory price of $189. Yes, this includes the entire feature-packed T/Maker package, so please treat yourself to this excellent super productive software today. Experience the power of true software integration on your Epson. Order T/Maker today. Offer may not repeat, so order now.

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NEW!

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